White-Label Product

Communication Protocol:

U1-24V24IB

Revision 1.0 May 2023

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INTERFACE CONFIGURATION & MESSAGE FORMATTING

RS-485 INTERFACE

RS-485 CONFIGURATION

Baud Rate (bps)	9600
Parity	N
Byte Size	8
Stop Bits	1

RS-485 MESSAGE FORMAT

	Start Flag (1-Byte)	Target Address (1-Byte)	Data ID (1-Byte)	Data Length (1-Byte)	Data Content (8-Bytes)	CRC (1-Byte)
PC-to-BMS	0xA5	0x40	*	0x08	[0x0 , 0x0 , 0x0 , 0x0 , 0x0 , 0x0 , 0x0 , 0x0]	**
BMS-to-PC	0xA5	0x01	*	0x08	*	**

* See Message Contents
** See computation method below

The CRC for a given message is simply the LSB of the sum of all preceding message bytes. For example:

	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
HEX	0xA5	0x40	0x90	0x08	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	?
DEC	165	64	144	8	0	0	0	0	0	0	0	0	?

Message Sum: *165 + 64 + 144 + 8 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 381*
CRC: *381 & 0xFF = **0x7D***

	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
FULL	0xA5	0x40	0x90	0x08	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x7D

CAN INTERFACE

CAN CONFIGURATION

Baud Rate (bps)	250k
Termination	120Ω

CAN MESSAGE FORMAT

	CAN ID				Data Content							
	Priority	Data ID	Target Address	Sender Address								
	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
PC-to-BMS	0x18	*	0x01	0x40	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
BMS-to-PC	0x18	*	0x40	0x01	*							

* See Message Contents

MESSAGE CONTENTS

Data ID			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0x90		Byte 0	X	X	X	X	X	X	X	X	Stack Voltage (0.1 V)
		Byte 1	X	X	X	X	X	X	X	X	
		Byte 2	X	X	X	X	X	X	X	X	Gather Total (0.1 V)
		Byte 3	X	X	X	X	X	X	X	X	
		Byte 4	X	X	X	X	X	X	X	X	Current (0.1 A, +30000 offset)
		Byte 5	X	X	X	X	X	X	X	X	
		Byte 6	X	X	X	X	X	X	X	X	SOC (0.1%)
		Byte 7	X	X	X	X	X	X	X	X	
			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0x91		Byte 0	X	X	X	X	X	X	X	X	Maximum cell voltage (mV)
		Byte 1	X	X	X	X	X	X	X	X	
		Byte 2	X	X	X	X	X	X	X	X	Position of maximum voltage cell
		Byte 3	X	X	X	X	X	X	X	X	Minimum cell voltage (mV)
		Byte 4	X	X	X	X	X	X	X	X	
		Byte 5	X	X	X	X	X	X	X	X	Position of minimum voltage cell
		Byte 6									Reserved
		Byte 7									Reserved
			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0x92		Byte 0	X	X	X	X	X	X	X	X	Maximum cell temperature (°C, +40 offset)
		Byte 1	X	X	X	X	X	X	X	X	Position of maximum temperature cell
		Byte 2	X	X	X	X	X	X	X	X	Minimum cell temperature (°C, +40 offset)
		Byte 3	X	X	X	X	X	X	X	X	Position of minimum temperature cell
		Byte 4									Reserved
		Byte 5									Reserved
		Byte 6									Reserved
		Byte 7									Reserved
			Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0x93		Byte 0							X	X	Battery status (0 = Stationary, 1 = Charge, 2 = Discharge)
		Byte 1								X	Charge MOSFET state (0 = Open, 1 = Closed)
		Byte 2								X	Discharge MOSFET state (0 = Open, 1 = Closed)
		Byte 3	X	X	X	X	X	X	X	X	BMS lifecycle Count (0-255)
		Byte 4	X	X	X	X	X	X	X	X	Remaining Capacity (mAh)
		Byte 5	X	X	X	X	X	X	X	X	
		Byte 6	X	X	X	X	X	X	X	X	
		Byte 7	X	X	X	X	X	X	X	X	

Data ID		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	**Message Breakdown** / **Description**
0x94	Byte 0	X	X	X	X	X	X	X	X	Maximum modules in series
	Byte 1	X	X	X	X	X	X	X	X	Number of NTC sensors
	Byte 2	X	X	X	X	X	X	X	X	Charger Status (0 = Disconnect, 1 = Access)
	Byte 3	X	X	X	X	X	X	X	X	Load Status (0 = Disconnect, 1 = Access)
	Byte 4								X	DI1 state (0 = OFF, 1 = ON)
								X		DI2 state (0 = OFF, 1 = ON)
							X			DI3 state (0 = OFF, 1 = ON)
						X				DI1 state (0 = OFF, 1 = ON)
					X					DO1 state (0 = OFF, 1 = ON)
				X						DO2 state (0 = OFF, 1 = ON)
			X							DO3 state (0 = OFF, 1 = ON)
		X								DO4 state (0 = OFF, 1 = ON)
	Byte 5									Reserved
	Byte 6									Reserved
	Byte 7									Reserved

Data ID		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0x95	Byte 0	X	X	X	X	X	X	X	X	Frame number (Starts at 0x0)
	Byte 1	X	X	X	X	X	X	X	X	Cell **X** voltage (mV)
	Byte 2	X	X	X	X	X	X	X	X	**X** = (3 × Frame Number) + 1
	Byte 3	X	X	X	X	X	X	X	X	Cell **Y** voltage (mV)
	Byte 4	X	X	X	X	X	X	X	X	**Y** = (3 × Frame Number) + 2
	Byte 5	X	X	X	X	X	X	X	X	Cell **Z** voltage (mV)
	Byte 6	X	X	X	X	X	X	X	X	**Z** = (3 × Frame Number) + 3
	Byte 7									Reserved

Data ID		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0x96	Byte 0	X	X	X	X	X	X	X	X	Frame number (Starts at 0x0)
	Byte 1	X	X	X	X	X	X	X	X	Cell **X** temperature (°C, +40 offset)
	Byte 2	X	X	X	X	X	X	X	X	**X** = (3 × Frame Number) + 1
	Byte 3	X	X	X	X	X	X	X	X	Cell **Y** temperature (°C, +40 offset)
	Byte 4	X	X	X	X	X	X	X	X	**Y** = (3 × Frame Number) + 2
	Byte 5	X	X	X	X	X	X	X	X	Cell **Z** temperature (°C, +40 offset)
	Byte 6	X	X	X	X	X	X	X	X	**Z** = (3 × Frame Number) + 3
	Byte 7									Reserved

Data ID		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0x97	Byte 0	X	X	X	X	X	X	X	X	Cell 1-8 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 1)
	Byte 1	X	X	X	X	X	X	X	X	Cell 9-16 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 9)
	Byte 2	X	X	X	X	X	X	X	X	Cell 17-24 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 17)
	Byte 3	X	X	X	X	X	X	X	X	Cell 25-32 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 25)
	Byte 4	X	X	X	X	X	X	X	X	Cell 33-40 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 33)
	Byte 5	X	X	X	X	X	X	X	X	Cell 41-48 balance state (0 = OFF, 1 = ON) (Cell number = Bit index + 41)
	Byte 6									Reserved
	Byte 7									Reserved

Data ID	Message Breakdown									Description
		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
0x98	Byte 0								X	High Cell Voltage (Level 1)
								X		High Cell Voltage (Level 2)
							X			Low Cell Voltage (Level 1)
						X				Low Cell Voltage (Level 2)
					X					High Stack Voltage (Level 1)
				X						High Stack Voltage (Level 2)
			X							Low Stack Voltage (Level 1)
		X								Low Stack Voltage (Level 2)
	Byte 1								X	High Charge Temperature (Level 1)
								X		High Charge Temperature (Level 2)
							X			Low Charge Temperature (Level 1)
						X				Low Charge Temperature (Level 2)
					X					High Discharge Temperature (Level 1)
				X						High Discharge Temperature (Level 2)
			X							Low Discharge Temperature (Level 1)
		X								Low Discharge Temperature (Level 2)
	Byte 2								X	Over-Current Charge (Level 1)
								X		Over-Current Charge (Level 2)
							X			Over-Current Discharge (Level 1)
						X				Over-Current Discharge (Level 2)
					X					High SOC (Level 1)
				X						High SOC (Level 2)
			X							Low SOC (Level 1)
		X								Low SOC (Level 2)
	Byte 3								X	Excessive Voltage Delta (Level 1)
								X		Excessive Voltage Delta (Level 2)
							X			Excessive Temperature Delta (Level 1)
						X				Excessive Temperature Delta (Level 2)
										Reserved
	Byte 4								X	Charge MOSFET Over-Temperature Warning
								X		Discharge MOSFET Over-Temperature Warning
							X			Charge MOSFET Temperature Sensor Error
						X				Discharge MOSFET Temperature Sensor Error
					X					Charge MOSFET Adhesion Error
				X						Discharge MOSFET Adhesion Error
			X							Charge MOSFET Open-Circuit Error
		X								Discharge MOSFET Open-Circuit Error
	Byte 5								X	AFE Measurement Error
								X		Voltage Measurement Error
							X			Temperature Measurement Error
						X				EEPROM Storage Error
					X					Oscillator Error
				X						Pre-Charge Failure
			X							External Communication Failure
		X								Internal Communication Failure
	Byte 6								X	Over-Current Protection Engaged
								X		Module Under-Voltage Protection Engaged
							X			Short-Circuit Protection Engaged
						X				Voltage too low to Charge
										Reserved
	Byte 7	X	X	X	X	X	X	X	X	Fault Code

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