Battery Management System

CANBUS Interface Specification

Overview

The BMS Broadcaster program will export a set of data via a Canbus hardware link. The data set is open and described here to facilitate 3rd party usage of the data generated by the Battery Management System.

The BMS uses the CANBUS in a very basic way. There is no high level protocol. The details of the protocol are described in **CANSpecification 2.0** and will not be repeated here.

The protocol used by the BMS is referred to as the "Basic Broadcast CANBUS" protocol. There two roles defined for nodes on the bus--Broadcaster. In the BMS a node has only one role and does not change roles.

The BMS uses the following link level spec.
  1) bitrate; 500Kbps
  2) Packet Rate; 50milliseconds
  3) packet; standard format
  4) ID; 04D

The CANBUS packet allows for an 8 byte data frame. This is sufficient for the BMS so there is no higher level layer. In the Basic Broadcast CANBUS protocol the ID field is the fundamental indicator of the data encoding in the data frame. For the 04D id the data frame is defined as follows:

Index		Parm	Value				
hex	hex	ascii	hex	hex	hex	hex	hex

Illustration 1: Basic Broadcast CANBUS Data Frame

This encoding was selected for its simplicity and ease of debugging. Each byte is an ASCII character. It is designed for data that is arranged into arrays. The Index field is the element number of the array, the Parameter field (Parm) indicates the array and the Value is the value of the element in the array. This allows for arrays up to 255 in length and values to a million. If the actors in this protocol restrict thBMSelves to printable ASCII characters there are around 100 possible arrays. The BMS system uses 4 arrays.

The data ontology is defined outside of the protocol and agreed to by the parties of the communication.

Field Encoding

Field	Range	Domain
Index	00-FF	ascii hex
Parm	{v,t,s,%}	ascii
Value	00000-FFFFF	ascii hex

Interface

Picture 1: CANBUS interface

A CANBUS communication board is installed inside the BMS-CPU (as shown in the above picture). The CANBUS communication interface is a 5-pin connector. The communication output pins are: CANH, CANL and GND. Pins 12V and NC are not used. A matching female connector is also included.

BMS Parm Specification

Parm	Index	Meaning	Value
v	0	integer	total number of cells
	1-7F	cell number	cell voltage in millivolts
t	0	integer	Total number of cells
	1-7F	cell number	Cell temperature in degree f, encoded 2's complement
%	0	integer	Total number of summary fields
	1-15	Index	See pack Summary table below
s	0	Integer	Total number of alert fields
	1-11	Index	See alert summary below a non-zero value indicates the alert is active

Pack Summary

A set of variables, each describing some attribute of the pack. This set of variables will be broadcast across the CANBUS with a Parm Field of "%".

Index	Label	Synopsis
1	Official Cell Count	The Official cell count is either the specified cell count or the number of cells found by a test.
2	Observed Cell Count	The Observed cell count is the actual number of cells found in a pack. This number is recalculated on each scan of the pack.
3	Ave Cell Temp	The average cell temperature.
4	Ave Cell voltage	The average cell voltage.
5	Max Cell Temp	The highest temperature found on any cell.
6	Max Cell Temp Index	The index number of the cell with the highest temperature.
7	Max Cell Voltage	The highest voltage found on any cell during the last scan.
8	Max Cell Voltage Index	The index number of the cell with the highest voltage.
9	Min Cell Voltage	The lowest voltage found on any cell during the last scan.
10	Min Cell Voltage Index	The index number of the cell with the lowest voltage.
11	Pack Charge	The last voltage reading of the entire pack using an A2D for pack voltage.
12	Pack Current	The last current reading of the entire pack using the pack shunt. Positive current is discharge, negative current is charging.
13	Pack Capacity	The State-Of-Charge.
14	Pack Alert	The current alert being presented on the display.
15	Timestamp	Timestamp of the last sample.
16	Reserved	
17	Min Cell Temp	The lowest temp found on any cell during the last scan.
18	Min Cell Temp Index	The index number of the cell with the lowest temp.

Alert Summary

Index	Level	Message text (30chars)	Synopsis
1	Info:	Pack Normal	The normal operation alert is post when there are no other valid alerts.
2	Alarm:	Cell Temperature Too High	When a cell temperature exceeds the max defined temperature for a cell, a "Cell Temperature too high" alert is posted.
3	Alarm:	Cell Voltage Too High	When a cell voltage exceeds the max defined cell voltage, a "Cell Voltage Too High" alert is posted.
4	Warn:	Pack Voltage High	A "Pack Over Voltage" warning is presented when the pack voltage is off the scale, higher that High voltage setting but less that the pack max voltage setting. The setting is a function of the number of observed cell in the pack.
5	Alarm:	Cell Voltage Too Low	When a cell voltage below the min defined cell voltage, a "Cell Voltage Too Low" alert is posted.
6	Warn:	Pack Voltage Low	A "Pack Under Voltage" warning is presented when the pack voltage is off the scale, lower that min voltage setting but less that the pack low alarm voltage setting. The setting is a function of the number of observed cell in the pack.
7	Alarm:	Pack Current Too High	When the pack current exceeds the max defined current for the pack, a "Pack Current Too High" alert is posted.
8	Warn:	Pack Current High	A "Pack Over Current" warning is presented when the pack current is off the scale.
9	FAULT:	Pack to Chassis Connection Detected	A "Pack to Chassis Connection Detected" fault (ground fault) is a detected connection or leakage path between the pack and the chassis.
10	FAULT:	Pack to Cell Com Error	The "Pack has unmanaged cells" alert is a report that the detected count of the cells in the pack is different than the official cell count. This is considered to be a hardware error. The most common cause is a loss of communication connectivity of sense boards.
11	FAULT:	System Error	The system error is a software detected condition that has not been defined.

The presents of an alert is represented by a non-zero value field in the Basic Broadcast CANBUS data frame