1 NMEA2000 BMS protocol

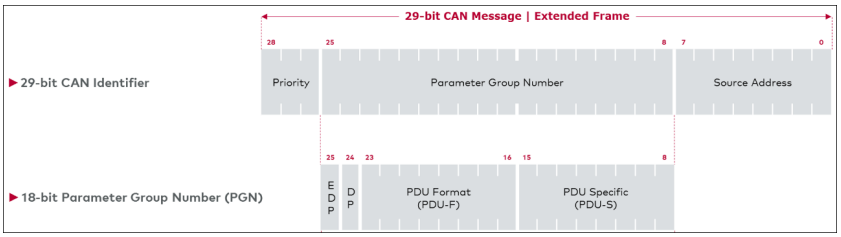
1.1 Interface definition

Speed : 250 kbps
ID : 29-bit CAN 2.0B

1.2 Message definition

NMEA2000 Identifier definition.

<3-bits priority><1-bit reserved><1-bit datapage>< 16-bits PGN >< 8-bit source address >



	DEC	HEX	BIN	note
PR (Priority)	6	6	110	1...8
PGN (Parameter group number)	127506	1F212	011111001000010010	DC Detailed Status
EDP (extended datapage)	0	0	0	Reserved
DP (Datapage)	1	1	1	parameter group of this ID
PDU Format (0...239 adressable, 240...255 broadcast)	242	F2	11110010	PDU2 (broadcast)
PDU Specific / destination address	18	12	00010010	PDU Specific
SA (Source address)	80	50	01010000	Broadcast Address (BCA)

	DEC	HEX	BIN
CAN ID	435294800	19F21250	11001111100100001001001010000

As described in the list below a PGN consists of datapage + PGN. For example 0x1F214 means: Datapage = 1
PGN = 0XF214

1.3 PGN list

Data	PGN Name	PGN dec	PGN hex	Field	Remarks
Battery pack voltage	Battery Status	127508	0x1F214	2	Battery instance 0
Battery pack current	Battery Status	127508	0x1F214	3	Battery instance 0
Battery pack highest temperature	Battery Status	127508	0x1F214	4	Battery instance 0
Lowest cell voltage in pack	Battery Status	127508	0x1F214	2	Battery instance 1
Lowest cell temperature in pack	Battery Status	127508	0x1F214	4	Battery instance 1
Highest cell voltage in pack	Battery Status	127508	0x1F214	2	Battery instance 2
Highest cell temperature in pack	Battery Status	127508	0x1F214	4	Battery instance 2
State-Of-Charge (SOC)	DC detailed status	127506	0x1F212	4	DC instance 0
Time-To-Go (TTG)	DC detailed status	127506	0x1F212	6	DC instance 0
Amp hours	DC detailed status	127506	0x1F212	8	DC instance 0

Notes:

- Battery instance 0 and DC Instance 0 are the same.
- The DC detailed status is a NMEA2000 fast packet message.
- The default source address of the BMS is 0x50.

1.3.1 PGN: Battery Status, 127508 (0x1F214)

There are three battery status messages that are separated by the "Battery Instance".

1.3.1.1 Battery Instance "0"

0x1F214 - Battery Status			CAN ID 0x19F21450
Periodicity:		1500 milliseconds	
Priority Default:		6	
Format:		Little Endian/Intel convention	
Single Frame:		Yes	
1	Byte 0	**Battery Instance = 0**	
		Data Length:	8 bit, uint8
		Unit:	Generic numeric ID, short
		Resolution:	1 bit
		Range:	0 to 252
2	Byte 1 Byte 2	Battery Voltage DC	
		Data Length:	16 bit, int16
		Unit:	Voltage, DC
		Resolution:	0.01 V
		Range:	+/- 327.64 V
3	Byte 3 Byte 4	Battery Current, + = battery is charged, - = battery is discharged	
		Data Length:	16 bit, int16
		Unit:	Current, Electric
		Resolution:	0.1 A
		Range:	+/- 3276.4 A
4	Byte 5 Byte 6	Highest Battery Temperature	
		Data Length:	16 bit, uint16
		Unit:	Generic Temperature, Kelvin
		Resolution:	0.01 K
		Range:	0 to 655.32 deg K
5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length:	8 bit, uint8
		Unit:	Sequence ID, short
		Resolution:	1 bit
		Range:	0 to 252

1.3.1.2 Battery Instance "1"

0x1F214 - Battery Status Lowest Value's			CAN ID 0x19F21450
Periodicity:		1500 milliseconds	
Priority Default:		6	
Format:		Little Endian/Intel convention	
Single Frame:		Yes	
1	Byte 0	**Battery Instance = 1**	
		Data Length:	8 bit, uint8
		Unit:	Generic numeric ID, short
		Resolution:	1 bit
		Range:	0 to 252
2	Byte 1 Byte 2	Lowest cell voltage in pack	
		Data Length:	16 bit, int16
		Unit:	Voltage, DC
		Resolution:	0.01 V
		Range:	+/- 327.64 V
3	Byte 3 Byte 4	not implemented (0x7FFF)	
		Data Length:	16 bit, int16
		Unit:	-
		Resolution:	-
		Range:	-
4	Byte 5 Byte 6	Lowest cell temperature in pack	
		Data Length:	16 bit, uint16
		Unit:	Generic Temperature, Kelvin
		Resolution:	0.01 K
		Range:	0 to 655.32 deg K
5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length:	8 bit, uint8
		Unit:	Sequence ID, short
		Resolution:	1 bit
		Range:	0 to 252

1.3.1.3 Battery Instance "2"

0x1F214 - Battery Status Highest Value's			CAN ID 0x19F21450
Periodicity:		1500 milliseconds	
Priority Default:		6	
Format:		Little Endian/Intel convention	
Single Frame:		Yes	
1	Byte 0	**Battery Instance = 2**	
		Data Length:	8 bit, uint8
		Unit:	Generic numeric ID, short
		Resolution:	1 bit
		Range:	0 to 252
2	Byte 1 Byte 2	Highest cell voltage in pack	
		Data Length:	16 bit, int16
		Unit:	Voltage, DC
		Resolution:	0.01 V
		Range:	+/- 327.64 V
3	Byte 3 Byte 4	not implemented (0x7FFF)	
		Data Length:	16 bit, uint16
		Unit:	-
		Resolution:	-
		Range:	-
4	Byte 5 Byte 6	Highest cell temperature in pack	
		Data Length:	16 bit, int16
		Unit:	Generic Temperature, Kelvin
		Resolution:	0.01 K
		Range:	0 to 655.32 deg K
5	Byte 7	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length:	8 bit, uint8
		Unit:	Sequence ID, short
		Resolution:	1 bit
		Range:	0 to 252

1.3.2 PGN: DC Detailed Status, 127506 (0x1F212)

0x1F212 -DC Detailed Status			CAN ID 0x19F21250
Periodicity:		1500 milliseconds	
Priority Default:		6	
Format:		Little Endian/Intel convention	
Single Frame:		No (fast packet)	
1	Byte 0	Sequence ID, an upward counting number used to tie related information together between different PGNs.	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Sequence ID, short 1 bit 0 to 252
2	Byte 1	DC Instance. = 0	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic numeric ID, short 1 bit 0 to 252
3	Byte 2	DC Type	
		Data Length: Unit: Resolution: Range:	8 bit, int8 - 1 bit Variable
		0x00 = Battery, 0x01 = Alternator, 0x02 = Convertor, 0x03 = Solar Cell, 0x04 = Wind Generator, 0x05 = Reserved, thru 0xFD = Reserved 0xFE = Error 0xFF = Data Not Available	
4	Byte 3	State-Of-Charge	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic Absolute Percentage 0-252% 1 % 0 to 252 %
5	Byte 4	State-Of-Health (not implemented 0xFF)	
		Data Length: Unit: Resolution: Range:	8 bit, uint8 Generic Absolute Percentage 0-252% 1 % 0 to 252 %

6	Byte 5 Byte 6	Time remaining	energy left / averaged power
		Data Length: Unit: Resolution: Range:	16 bit, uint16 Time 1 minute 0 to 65532 minutes
7	Byte 7 Byte 8	Ripple voltage (not implemented 0xFF)	
		Data Length: Unit: Resolution: Range:	16 bit, uint16 AC ripple voltage 1 mV 0 to 65532 mV
8	Byte 9 Byte 10	Amp hours	
		Data Length: Unit: Resolution: Range:	16 bit, uint16 Battery capacity 1 Ah 0 to 65532 Ah

The DC detailed status is actually two messages that are combined as one.

NOTE: The DC detailed message is a NMEA2000 fast packet. This means that it has a little protocol overhead.

The message consists out of 2 messages.

Message	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1	b0 to b4 = 00000 b4 to b7 = 3-bit Sequence counter	Total number of data bytes. For this PGN it is 0x0B.	SID	DC Instance	DC type	SOC	SOH (=0xFF)	Time remaining byte 0
2	b0 to b4 = frame counter b4 to b7 = 3-bit Sequence counter	Time remaining byte 1	0XFF	0XFF	Amp hours byte 0	Amp hours byte 1	0XFF	0XFF

= DC Detailed Status PGN