

**BMV - NMEA 2000 drop cable**



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# 1 Introduction

## 1.1 BMV 600 series

The BMV 600 battery monitors maintain detailed status information of a battery bank. The BMV602S can in addition monitor a starter battery. Status of the battery and battery history can be viewed on the display. See <http://www.victronenergy.com/> for complete product specification.

**Note:** The minimal firmware version of a BMV-60xS is 2.06, released on 22<sup>nd</sup> October 2009.

## 1.2 NMEA 2000

The National Marine Electronics Association (<http://www.nmea.org/>) defines standardized protocols in order to facilitate interconnection of digital equipment on boats. NMEA 2000 is an application level CAN-bus protocol based on the J1939. Products of different manufacturers can be connected to a shared network cable making the data commonly available for displaying, control and other functions available on the network.

## 1.3 BMV NMEA 2000 drop cable

The BMV NMEA 2000 drop cable translates the information known by a BMV to the format expected by NMEA 2000. Battery information can therefore be displayed on common purpose displays from other manufacturers which accept the NMEA 2000 data being sent. Furthermore actions can be taken based on the values reported and/or alarm / relay states by NMEA 2000 devices capable of doing so.

## 1.4 More general information

See our Data communication Whitepaper available on our website for more information.

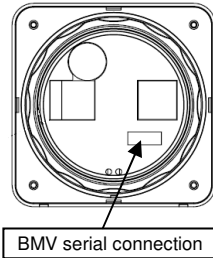
<http://www.victronenergy.com/support-and-downloads/white-papers/>

## 1.5 Installation

### **Connection to the BMV**

The drop cable can be directly connected to the BMV 600.

**Note:** *The connection does not provide strain relief by itself. It is therefore advisable to fix the cable near the connection.*



### **Connection to NMEA 2000**

NMEA 2000 requires a single backbone where products must connect to with drop cables. The BMV drop cable is equipped with a Micro-C (M12) male connector for this purpose, intended to be connected to a corresponding T-connector in the backbone. Refer to a NMEA 2000 cable supplier for details about the NMEA 2000 network cabling and required network topology.

NMEA 2000 requires a single network power supply. The network will therefore not function without external power!

The NMEA 2000 backbone must be terminated with resistors at both ends. The network will not function properly without them!

## 1.6 Sent / received NMEA 2000 messages

NMEA 2000 defines several messages. Messages are identified by their parameter group number (PGN). A textual description of the message is publicly available on the NMEA 2000 website (<http://www.nmea.org/>). Detailed specification of the protocol and message definition or part thereof can be ordered online.

The table below list the messages which are transmitted by the product.

PGN	PGN(hex)	Name
59392	0xE800	ISO Acknowledgment
60928	0xEE00	ISO Address Claim
61184	0xEF00	Proprietary message (PDU Format)
65280	0xFF00	Proprietary message (PDU2 Format)
126208	0x1ED00	NMEA - Request group function
126464	0x1EE00	Receive/Transmit PGN's group function
126996	0x1F014	Product Information
126998	0x1F016	Configuration Information
127502	0x1F20E	Switch Bank Control
127506	0x1F212	DC Detailed Status
127508	0x1F214	Battery Status

The following messages are accepted by the product:

PGN	PGN(hex)	Name
59904	0xEA00	ISO Request
60928	0xEE00	ISO Address Claim
61184	0xEF00	Proprietary message (PDU Format)
65240	0xFED8	ISO Commanded Address
65281	0xFF01	Proprietary message (PDU2 Format)
126208	0x1ED00	Receive/Transmit PGN's group function
126720	0x1EF00	Proprietary Fast Packet

## 1.7 Transmitting messages periodically

The dynamic values of the main battery being monitored are reported in the Battery Status and DC Detailed Status. The Battery Status message contains the Battery Voltage and Battery Current. The DC Detailed Status the State of Charge (SOC) and Time To Go (TTG). These messages are broadcasted once per 1.5 second by default. These messages contain an instance field, specifying which battery is reported. The main battery has a default value of 0. Since the consumed Ah is not part of NMEA 2000 definition it is sent by a proprietary message.

A BMV602S can monitor a starter battery voltage as well. The voltage of the starter battery is reported by a separate Battery Status message with a default instance of 1. This message is only sent when a BMV602S is connected.

The alarm and relay states are reported by the Switch Bank Control message (127502). Device on the NMEA 2000 bus can use these states to react upon. The conditions for alarms and relay closure can be set on the BMV in the setup menu. The table below describes the meaning of the reported binary states when turned on. When the condition is not met “Turn off” is sent. “No action” is sent for unknown or reserved fields. The Switch Bank Control is sent once per 6 seconds by default; it is directly sent when a value changed.

Signal	Meaning
Bank Instance	Instance field of the message, default value 0.
Switch 1 – relay	“Turn On” – The relay on the BMV is active, the contact is closed
Switch 2 – alarm	“Turn On” – There is one or more alarm on the BMV
Switch 3 – low voltage*	“Turn On” – Battery voltage is too low
Switch 4 – high voltage*	“Turn On” – Battery voltage is too high
Switch 5 – low SOC*	“Turn On” – The Battery state of charge is too low
Switch 6 – low voltage 2*	“Turn On” – Starter Battery voltage is too low
Switch 7 – high voltage 2*	“Turn On” – Starter Battery voltage is too high
Switch 8 ... 28	Not used, report as “No Action”

\* BMV version 2.08 and higher



## **1.8 Altering message transmission / instances**

The transmission rate, priority and instances of these messages can be changed by using the appropriate NMEA 2000 Request Group Function (126208), a Complex Request, Complex Command and Complex write respectively.

The transmission settings should only be changed with care, since data consumers might anticipate in the data arriving in certain intervals.

Some NMEA 2000 devices might require that all battery instances on the bus must be configured to unique values. This is typically observed by alternating values being displays. A Complex Write can be used to indicate which instance should be changed and what the new instance value must be. Any attempt to make the starter battery and main battery instances equal will be denied.

## **1.9 Other settings**

NMEA 2000 requires a method for changing some fields in the NAME. The Device Function Instance and System Instance of the BMV drop cable can be altered by a Complex Command.

The Installation Description, field 1 and field 2 in the Configuration Information can be set to any desired text (for example location, purpose of the battery etc) by a Complex Command.

The used network address can be changed by a CMDA message send as BAM. Since address assignment is handled automatically within NMEA 2000, manually setting the source addresses is normally not needed.

## 2 Proprietary messages

Not all values reported by the BMV can be sent with standard NMEA 2000 messages. These values are available by the proprietary message 61184 (0xEF00) to the broadcast address 61439 (0xEFFF). All numbers are Little Endian. The format of message 61184 (0xEF00) as used by Victron Energy is:

Signal	Type	Meaning
Manufacturer	UInt16	Number identifying the manufacturer. 0x9966 for Victron Energy.
Register Id	UInt16	Number identifying the payload.
Payload	4 bytes	The payload itself.

A request for one or more proprietary message has the following format:

Signal	Type	Meaning
Manufacturer	UInt16	Number identifying the manufacturer. 0x9966 for Victron Energy.
Register ID	Int16	Set to 1: Request
Req register ID	UInt16	Requested Register ID
Req mask	UInt16	Requested Mask

All registers which, after being logically AND-ed with the mask, equal the requested register id will be returned. The request can be sent to all or addressed to a single device.

*Request for only register 0xEE00 has a payload of:*

0x66	0x99	0x01	0x00	0x00	0xEE	0xFF	0xFF
------	------	------	------	------	------	------	------

*With mask 0xFFE0 all register between 0xEE00- 0xEE1F are returned:*

0x66	0x99	0x01	0x00	0x00	0xEE	0xE0	0xFF
------	------	------	------	------	------	------	------

*If a request cannot be fulfilled a proprietary negative acknowledgement will be sent, which has register id = 2. For example a proprietary Nack for the request of register id 0xCC00, error 0x8000 is shown below. The message is addressed to the device sending the request.*

0x66	0x99	0x02	0x00	0x00	0xCC	0x00	0x80
------	------	------	------	------	------	------	------

An ISO Request for this PGN will return all available proprietary data.

## 2.1 BMV Historic values and Consumed Ah

The Register IDs of the historic values of the BMV listed in the table below. All values in the table below are encoded as 32 bit signed integers. The consumed Ah is included in the proprietary data, since it is not defined in NMEA 2000. Only the Consumed Ah supports Complex Group Functions, which can be used to change the transmission rate or stop automatic transmission.

Register ID	BMV value	Unit	Broadcast Interval
0xEE00	H1	0.1 Ah	not broadcasted
0xEE01	H2	0.1 Ah	not broadcasted
0xEE02	H3	0.1 Ah	not broadcasted
0xEE03	H4	-	not broadcasted
0xEE04	H5	-	not broadcasted
0xEE05	H6	0.1 Ah	not broadcasted
0xEE06	H7	0.01 V	not broadcasted
0xEE07	H8	0.01 V	not broadcasted
0xEE08	H9	s	not broadcasted
0xEE09	H10	-	not broadcasted
0xEE0A	H11	-	not broadcasted
0xEE0B	H12	-	not broadcasted
0xEE0C	H13	-	not broadcasted
0xEE0D	H14	-	not broadcasted
0xEE0E	H15	0.01 V	not broadcasted
0xEE0F	H16	0.01 V	not broadcasted
0xEEFF	Consumed Ah (CE)	0.1 Ah	1.5s

## 2.2 Product Identification

The following proprietary message can be requested for product identification. The message use the same format for 61184 (0xEF00) as described above. Note that the same messages are sent twice; once for the converter and once for the BMV itself. The firmware versions are directly interpreted from the hexadecimal representation, e.g. 0x000208 represent version 2.08.

### BMV 600 – NMEA 2000 drop cable

Register Id: 0x0100, Product Id		
Instance	UInt8	0
Product Id	UInt16	0x0100: BMV - NMEA 2000 drop cable

Register Id: 0x0102, Firmware Version		
Instance	UInt8	0
Firmware version	UInt24	Version of the BMV - NMEA 2000 drop cable

### BMV 600 – battery monitor

Register Id: 0x0100, Product Id		
Instance	UInt8	1
Product Id	UInt16	Kind of BMV connected: 0x0200: BMV600S 0x0201: BMV602S 0x0202: BMV600HS

Register Id: 0x0102, Firmware Version		
Instance	UInt8	1
Firmware version	UInt24	Firmware version of the BMV

## Restore defaults

When message 61184 (0xEF00) is addressed to the device with register Id set to 4, all settings of the device, with the exception of the obtained network address, will be restored to the default. The settings of the BMV itself remain untouched.

### 3 Specifications

<b>BMV - NMEA 2000 Drop Cable</b>	
<b>Network type</b>	<b>NMEA 2000</b>
<b>Network requirements</b>	<b>In conformance with NMEA 2000. Details are available from NMEA 2000 network suppliers.</b>
<b>Network connector</b>	<b>Micro-C / M12 / DeviceNet male.</b>
<b>Canbus supply voltage range</b>	<b>7V – 70VDC</b>
<b>Canbus current draw – typical</b>	<b>15 mA at 12VDC</b>
<b>NMEA2000 Load Equivalent Nr.</b>	<b>1</b>
<b>Operating temp. range</b>	<b>-20 – +50 °C</b>
<b>ENCLOSURE</b>	
<b>Measurements body (l x w x h)</b>	<b>70 x 50 x 20 mm</b>
<b>Weight</b>	<b>100 gram</b>



## 4 Notes



# Victron Energy Blue Power

Distributor:

Serial number:

Version : 05  
Date : March 14<sup>th</sup> 2013

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