BMV700 Series

Hex Protocol

victron energy
BLUE POWER

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1 VE.Direct Protocol

The frame format of the VE.Direct protocol has the following general format:

: [command] [data][data][…] [check]\n

Where the colon indicates the start of the frame and the newline is the end of frame. The sum of all data bytes and the check must equal 0x55. Since the normal protocol is in text values the frames are sent in their hexadecimal ASCII representation, ['0' .. '9'], ['A' .. 'F'], must be uppercase. There is no need to escape any characters.

: [command] [dataHighNibble, dataLowNibble][……] [checkHigh, checkLow] \n

Note: The command is only send as a single nibble. Numbers are sent in Little Endian format. An error response with value 0xAAAA is sent on framing errors.

Command		Description
1	Ping	Check for presence, the response is an 'Rsp ping' containing version and firmware type. See the response ping message.
3	App version	Returns the version of the firmware as stored in the header in an 'Rsp Done' message.
4	Product Id	The Product Id version will be returned by an 'Rsp Done' message. The returned value is the Product Id from the application header if present. If no application is present, the value from the product info is returned. This value is 0xFFFF if no valid application has ever been booted. BMV600S = 0x0200 BMV602S = 0x0201 BMV600HS = 0x0202 BMV700 = 0x0203 BMV702 = 0x0204 BMV700H = 0x0205 BMV712 = 0xA381
6	Restart	Restarts the device, no response is sent.
7	Get	Returns a get response with the requested data or error is returned. uint16 the id of the value to get uint8 flags, should be set to zero
8	Set	Returns a set response with the requested data or error is returned. uint16 the id of the value to set uint8 flags, should be set to zero type depends on id value
A	Async	Asynchronous data message. Should not be replied. uint16 the id of the value being returned uint8 flags, defined below type depends on id value
0, 2, 5, 9, B-F	reserved	

VE.Direct responses are formatted in the same manner as commands, but use response codes.:

Response		Description
1	Done	Successful execution of the received command. Payload depends on command.
3	Unknown	Unknown command, data is the unknown command.
5	Ping	The version number is directly interpreted from the hex representation, e.g. 0x0101 is version 1.01. The two most significant bits indicate the firmware type: b00: bootloader b01: application b10: tester b11: release candidate In case of release candidate the lowest two bits of the highest nibble together with type indicate the release candidate number. E.g. 0xD101 represents release candidate D of version 1.01. Note that there can only be 4 release candidates per version.
7	Get	uint16 id: of the value being returned uint8 flags: defined below type depends on id value
8	Set	uint16 id of the value which was set uint8 flags: defined below type depends on id value

The following set / get flags are currently defined (reply):

Flag	Name	Meaning
0x01	Unknown Id	The specified id does not exist
0x02	Not supported	Attempting to write to a read only value
0x04	Parameter Error	The new value is out of range or inconsistent

Get and Set items

Product information registers

The BMV contains both hard-coded and configurable product information. For registers which can be written to, this is indicated.

ID	Description	Display	Type	Unit
0x0100	Product Id (read-only)	-	Un32	-
0x0101	Product revision (read-only) (*)	-	Un24	-
0x010A	Serial number (read-only)	-	String32	-
0x010B	Model name (read-only)	-	String32	-
0x010C	Description (*)	-	String20	-
0x0120	Device uptime (read-only)	-	Un32	seconds
0x0150	Bluetooth capabilities (*)	-	Un32	-

Note 1: items marked with (*) are available on BMV712 only
Note 2: type *String32* is a max number. The length can be 32 or less, in which case it must be zero-ended.
Note 3: type *String20* is a max number. The length can be 20 or less, in which case it must be zero-ended.

Bluetooth capabilities (register 0x0150)

Bit	Name	Meaning
0	HAS_SUPPORT_FOR_BLE_MODE	Indicates whether BLE module actually supports VE_REG_BLE_MODE functionality.
1	BLE_MODE_OFF_IS_PERMANENT	Indicates whether disabling Bluetooth can be reverted by any means – which is not the case for the BMV, since it has a display.
2..31	-	Reserved for future use.

Note 1: available for BMV-712 since version v4.01

Monitor related registers

ID	Description	Display	Type	Unit
0xED8D	Main Voltage	MAIN	Sn16	0.01 V
0xED7D	Aux (starter) Voltage (1)	AUX	Sn16	0.01 V
0xED8F	Current	-	Sn16	0.1 A
0xED8C	Current (2, 3)	-	Sn32	0.001A
0xED8E	Power	-	Sn16	W
0xEEFF	Consumed Ah	-	Sn32	0.1 Ah
0x0FFF	SOC	-	Un16	0.01 %
0x0FFE	TTG	-	Un16	minutes
0xEDEC	Temperature (1)	-	Un16	0.01 K
0x0382	Mid-point voltage (1)	MID	Un16	0.01 V
0x0383	Mid-point voltage deviation (1)	MID	Sn16	0.1 %
0xEEB6	Synchronization state	SOC	Un8	-

Note 1: only available on BMV-702 and BMV-712
Note 2: available for BMV-712 since version v4.01
Note 3: available for BMV-70x since version v3.09

Historic data registers

ID	Description	Display	Type	Unit
0x0300	Depth of the deepest discharge	A	Sn32	0.1 Ah
0x0301	Depth of the last discharge	B	Sn32	0.1 Ah
0x0302	Depth of the average discharge	C	Sn32	0.1 Ah
0x0303	Number of cycles	D	Un32	
0x0304	Number of full discharges	E	Un32	
0x0305	Cumulative Amp Hours	F	Sn32	0.1 Ah
0x0306	Minimum Voltage	G	Sn32	0.01 V
0x0307	Maximum Voltage	H	Sn32	0.01 V
0x0308	Seconds since full charge	I	Un32	seconds
0x0309	Number of automatic synchronizations	J	Un32	
0x030A	Number of Low Voltage Alarms	L	Un32	
0x030B	Number of High Voltage Alarms	M	Un32	
0x030E	Minimum Starter Voltage (1)	P	Sn32	0.01 V
0x030F	Maximum Starter Voltage (1)	Q	Sn32	0.01 V
0x0310	Amount of discharged energy	R	Un32	0.01 kWh
0x0311	Amount of charged energy	S	Un32	0.01 kWh

Note 1: only available on BMV-702 and BMV-712

Monitor settings registers

ID	Description	Display	Type	Range	Default	Step	Unit
Battery settings							
0x1000	Battery Capacity	01	Un16	1..9999	200	1	Ah
0x1001	Charged Voltage	02	Un16	0..95	13.2	0.1	V
0x1002	Tail Current	03	Un16	0.5..10	4	0.1	%
0x1003	Charged Detection Time	04	Un16	1..50	3	1	min.
0x1004	Charge Efficiency	06	Un16	50..99	90	1	%
0x1005	Peukert Coefficient	05	Un16	1..1.5	1.25	0.01	-
0x1006	Current Threshold	07	Un16	0..2	0.1	0.01	A
0x1007	TTG Delta T	08	Un16	0..12	3	1	min.
0x1008	Discharge Floor (Relay Low Soc Set)	16	Un16	0..99	50	0.1	%
0x1009	Relay Low Soc Clear	17	Un16	0..99	90	0.1	%
0x1034	User Current Zero (read only)	-	Sn16	-32768..32767	0	1	ADC count
Alarm settings							
0xEEFC	Alarm Buzzer	32	Un8	0..1 (OFF, ON)	1	1	-
0x0320	Alarm Low Voltage	35	Un16	0..95	0	0.1	V
0x0321	Alarm Low Voltage Clear	36	Un16	0..95	0	0.1	V
0x0322	Alarm High Voltage	37	Un16	0..95	0	0.1	V
0x0323	Alarm High Voltage Clear	38	Un16	0..95	0	0.1	V
0x0324	Alarm Low Starter (1)	39	Un16	0..95	0	0.1	V
0x0325	Alarm Low Starter Clear (1)	40	Un16	0..95	0	0.1	V
0x0326	Alarm High Starter (1)	41	Un16	0..95	0	0.1	V
0x0327	Alarm High Starter Clear (1)	42	Un16	0..95	0	0.1	V
0x0328	Alarm Low SOC	33	Un16	0..99	0	0.1	%
0x0329	Alarm Low SOC Clear	34	Un16	0..99	0	0.1	%
0x032A	Alarm Low Temperature (1)	45	Un16	0=disabled; 174..372	0	0.01	K
0x032B	Alarm Low Temperature Clear (1)	46	Un16	0=disabled; 174..372	0	0.01	K
0x032C	Alarm High Temperature (1)	43	Un16	0=disabled; 174..372	0	0.01	K
0x032D	Alarm High Temperature Clear (1)	44	Un16	0=disabled; 174..372	0	0.01	K
0x0331	Alarm Mid Voltage *	47	Un16	0..99	0	0.1	%
0x0332	Alarm Mid Voltage Clear *	48	Un16	0..99	0	0.1	%
0x031F	Alarm Acknowledge	-	-	-	-	-	-
Relay settings							
0x034F	Relay Mode	11	Un8	0..2 (DFLT, CHRG, REM)	0	1	-
0x034D	Relay Invert	12	Un8	0..1 (OFF, ON)	0	1	-
0x034E	Relay State/Control	13	Un8	0..1 (OPEN, CLSD)	0	1	-
0x100a	Relay Minimal Enable Time	14	Un16	0..500	0	1	min
0x100b	Relay Disable Time	15	Un16	0..500	0	1	min
0x0350	Relay Low Voltage	18	Un16	0..95	0	0.1	V
0x0351	Relay Low Voltage Clear	19	Un16	0..95	0	0.1	V
0x0352	Relay High Voltage	20	Un16	0..95	0	0.1	V
0x0353	Relay High Voltage Clear	21	Un16	0..95	0	0.1	V
0x0354	Relay Low Starter (1)	22	Un16	0..95	0	0.1	V
0x0355	Relay Low Starter Clear (1)	23	Un16	0..95	0	0.1	V
0x0356	Relay High Starter (1)	24	Un16	0..95	0	0.1	V
0x0357	Relay High Starter Clear (1)	25	Un16	0..95	0	0.1	V
0x035A	Relay Low Temperature (1)	26	Un16	0=disabled; 174..372	0	0.01	K
0x035B	Relay Low Temperature Clear (1)	27	Un16	0=disabled; 174..372	0	0.01	K
0x035C	Relay High Temperature (1)	28	Un16	0=disabled; 174..372	0	0.01	K
0x035D	Relay High Temperature Clear (1)	29	Un16	0=disabled; 174..372	0	0.01	K
0x0361	Relay Mid Voltage (1)	30	Un16	0..99	0	0.1	%
0x0362	Relay Mid Voltage Clear (1)	31	Un16	0..99	0	0.1	%
Display settings							
0xEEFE	Backlight Intensity	49	Un8	0..9	5	1	-
0x0400	Backlight Always On	50	Un8	0..1 (OFF, ON)	0	1	-
0xEEF5	Scroll Speed	51	Un8	1..5	3	1	

ID	Description	Display	Type	Range	Default	Step	Unit
0xEEE0	Show Voltage	52	Un8	0..1 (OFF, ON)	1	1	-
0xEEE1	Show Auxiliary Voltage (1)	58	Un8	0..1 (OFF, ON)	1	1	-
0xEEE2	Show Mid Voltage (1)	60	Un8	0..1 (OFF, ON)	1	1	-
0xEEE3	Show Current	53	Un8	0..1 (OFF, ON)	1	1	-
0xEEE4	Show Consumed AH	55	Un8	0..1 (OFF, ON)	1	1	-
0xEEE5	Show SOC	56	Un8	0..1 (OFF, ON)	1	1	-
0xEEE6	Show TTG	57	Un8	0..1 (OFF, ON)	1	1	-
0xEEE7	Show Temperature (1)	59	Un8	0..1 (OFF, ON)	1	1	-
0xEEE8	Show Power	54	Un8	0..1 (OFF, ON)	1	1	-

Commands

ID	Description	Display	Type	Range	Default	Step	Unit
0x1029	Zero Current (write only)	09	-	-	-	-	-
0x102c	Synchronize (write only)	10	-	-	-	-	-
0x0004	Restore Defaults (write only)	62	-	-	-	-	-
0x1030	Clear History (write only)	63	-	-	-	-	-

Miscellaneous

ID	Description	Display	Type	Range	Default	Step	Unit
0xEEF9	SW Version (read only)	61	Un16	0x0000..0xFFFF	-	-	HEX (AA.BB)
0xEEF6	Setup Lock	64	Un8	0..1 (OFF, ON)	0	1	-
0xEEFB	Shunt Amps	65	Un16	1..9999	500	1	A
0xEEFA	Shunt Volts	66	Un16	0.001..0.1	0.05	0.001	V
0xEEF7	Temperature Unit (1)	67	Un8	0..1 (CELC, FAHR)	0	1	-
0xEEF4	Temperature coefficient (1)	68	Un16	0..20	0	0.1	%CAP/°C
0xEEF8	Auxiliary Input (1)	69	Un8	0..2 (START, MID, TEMP)	0	1	-
0x0FFD	Start synchronized (2,3)	70	Un8	0..1 (OFF, ON)	1	1	-
0xEC41	Settings changed timestamp (2)	-	Un32	0..0xFFFFFFFF	0xFFFFFFFF	-	seconds
0x0090	Bluetooth mode (2)	71	Un8	0..1 (OFF, ON)	1	1	-

Note 1: only available on BMV-702 and BMV-712
Note 2: available for BMV-712 since version v4.01
Note 3: available for BMV-70x since version v3.09

Settings changed (register 0xEC41)

Value	Name	Meaning
0	Local change	One or more settings have been modified through the BMV display's settings menu
1..0xFFFFFFFE	Timestamp	One or more settings have been modified by the VictronConnect app. Timestamp represents number of seconds since epoch: 1-1-1970 0:0:0.
0xFFFF FFFF	Invalid	Reflects that no settings have ever been modified since production or since this register was first introduced upon a firmware update.

Bluetooth mode (register 0x0090)

Value	Name	Meaning
0	OFF	Bluetooth interface disabled
1	ON	Bluetooth interface enabled
2..7	-	Reserved for future use

Examples

\n at the end of the message is implied.

Ping
:**1**54
:**5**0144**0**B
0x4401 = talking to application version 4.01

Application version
:**3**52
:**1**0144**0**F
Like ping, application version 4.01

Product Id
:**4**51
:**1**81A33**0**
`0xA381 = BMV712`

Restart
:**6**4F
No response, restarted

Get Battery Capacity
:**7**0010**00**3E
:**7**0010**00**C800**76**
Value = 0x00C8 = 200Ah

Set Battery Capacity
Set to 500Ah = 0x01F4
:**8**0010**00**F401**48**
:**8**0010**00**F401**48**
Acknowledged with the new value returned.

Set Battery Capacity to 0Ah
Set to 0Ah
:**8**0010**00**00003D
:**8**0010**04**0100**38**
Which flags a parameter error, and the nearest valid value (1Ah)

Get Battery Capacity (again)
:**7**0010**00**3E
:**7**0010**00**F401**49**
Still 500Ah

2 Text Protocol

When no VE.Direct queries are sent to the device, the charger periodically sends human readable (TEXT) data to the serial port. See the "VE.Direct Protocol" document for a detailed description of the contents and availability of the information.

Revision Log

15-07-2015 – rev 2
Split into public and private part

28-04-2017 – rev 3
Revised 'Monitor settings register' table:
- Synchronized menu item numbers
- Added register type column
- Clarified register descriptions

13-09-2018 – rev 4
Replaced device id with product id

02-10-2018 – rev 5
Revised 'Monitor settings' table:
- Added newly introduced 'initial battery state is synchronized' setting.
- Added newly introduced 'Bluetooth capabilities' setting
- Added newly introduced 'Bluetooth mode' setting
- Added newly introduced 'Settings changed' setting
- Added already existing but undocumented settings
Updated examples section

23-10-2018 – rev 6
Renamed *BMV70x* to *BMV700 series*