



User Manual

BN52V-840-43.6k BR

BN52V-1120-58.2k BR

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Approved by	D. Nieuwoudt

A. DOCUMENT SCOPE

Congratulations on purchasing a high quality BlueNova® product.

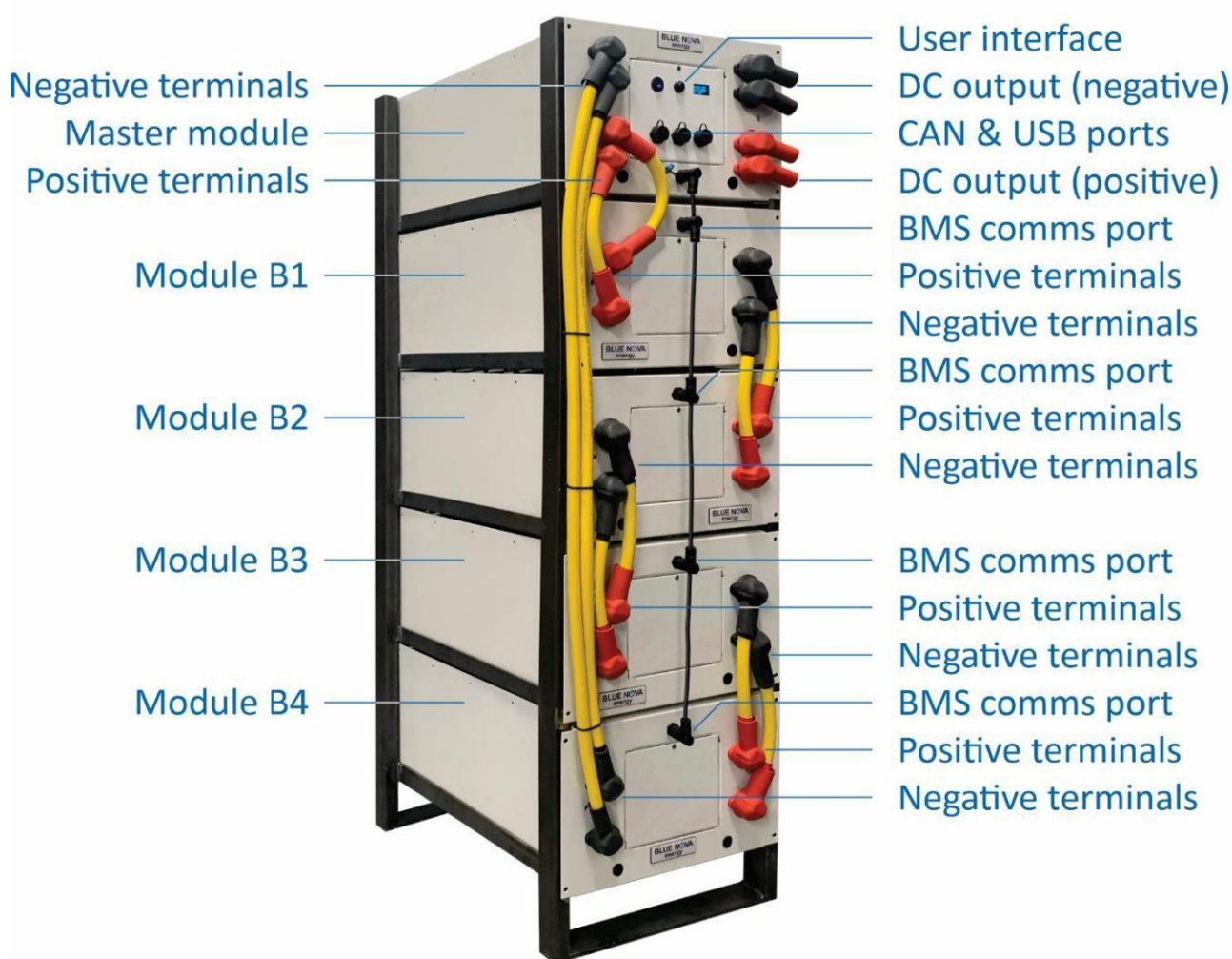
This document covers structural information, assembly & installation instructions, troubleshooting, safety & maintenance instructions, storage guidelines as well as emergency / first aid procedures specific to the **BlueNova® Battery Rack Product Range**.

If you are unsure whether this document is applicable to your battery, or if you have any questions or comments, kindly contact BlueNova® Technical Support:

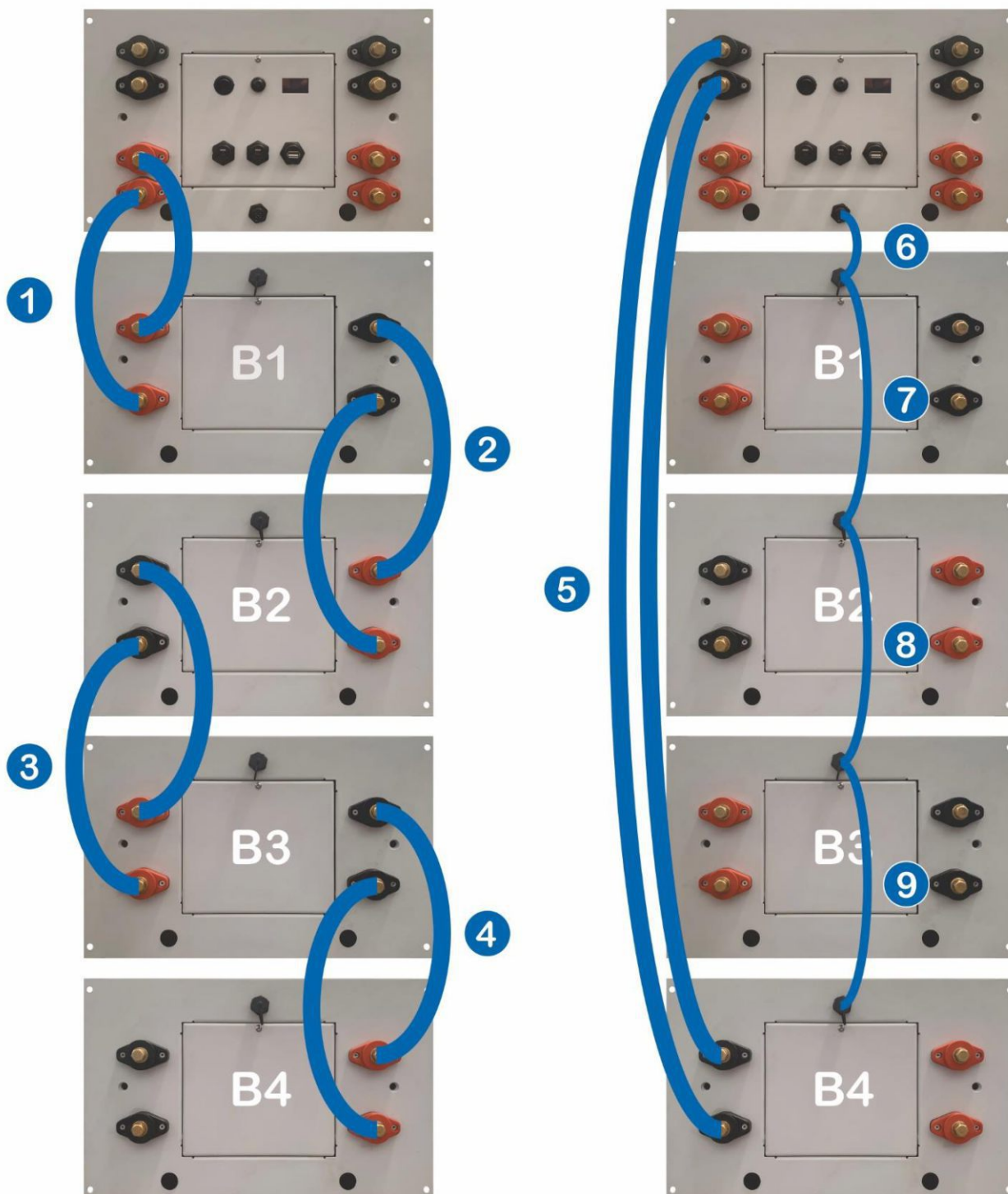
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B. STRUCTURAL OVERVIEW



C. ASSEMBLY INSTRUCTIONS



STEP-BY-STEP INSTRUCTIONS

Start by slotting the modules into the rack in the order illustrated above. From top to bottom: Master module, Module B1, Module B2, Module B3, Module B4. Then connect as follows:

1. Connect the master module's **positive** terminals (bottom left) with module B1's **positive** terminals.
2. Connect module B1's **negative** terminals with module B2's **positive** terminals.
3. Connect module B2's **negative** terminals with module B3's **positive** terminals.
4. Connect module B3's **negative** terminals with module B4's **positive** terminals.
5. Connect module B4's **negative** terminals with the master module's **negative** terminals (top left).
6. Connect the master module's BMS comms port with module B1's BMS comms port.
7. Connect module B1's BMS comms port with module B2's BMS comms port.
8. Connect module B2's BMS comms port with module B3's BMS comms port.
9. Connect module B3's BMS comms port with module B4's BMS comms port.

IMPORTANT: Failure to comply to the above sequence will likely result in damage to the battery's integrated electronic components. When assembling the battery, the DC connections must be completed first before the BMS communication connections are made. Conversely, when disassembling the battery, the BMS communication connections should be disconnected first (steps 9 – 6), after which the DC connections can be disconnected (steps 5 – 1).

D. INSTALLATION

1. VOLTAGE-BASED INSTALLATION

If the battery is not connected to hardware that is serial communication compatible, the following values highlighted in blue must be set on the inverter/charger:

Parameter	Cell V	Value	Comment
V high set	3.45 V	55.2 V	Typical bulk/absorption charge setpoint.
V float	3.4 V	54.4 V	Charger must reconnect when this voltage is reached.
V reconnect	3.20 V	51.2 V	Mains or generator must reconnect to charge batteries.
V low set	3 V	48.0 V	Inverter must switch off the load.

IMPORTANT: Inverter/charger voltage calibration

Some inverters/chargers have been known to return inaccurate results when measuring voltage. In such cases, the inverter/charger should be calibrated as follows:

Compare the voltage values displayed by the inverter/charger with that of a calibrated voltmeter. If the actual voltage differs by more than 100mV from that measured by the inverter/charger, apply this difference to the highlighted values above (i.e. if actual voltage = 56V while inverter voltage = 56.5V, the voltage difference = 0.5V should be subtracted from each of the set values above).

Note: Some inverters/chargers have pre-programmed lead-acid related algorithms & functionalities such as *auto-desulfation* and *equalisation*. These functionalities should be disabled, where possible.

2. SERIAL COMMUNICATION

BlueNova® BR batteries include serial communication functionality via CAN protocol. Connecting a BlueNova® BR battery to a compatible inverter, charger or other third-party hardware device normally negates the necessity of manual voltage-based installation procedures, as described in the section above.

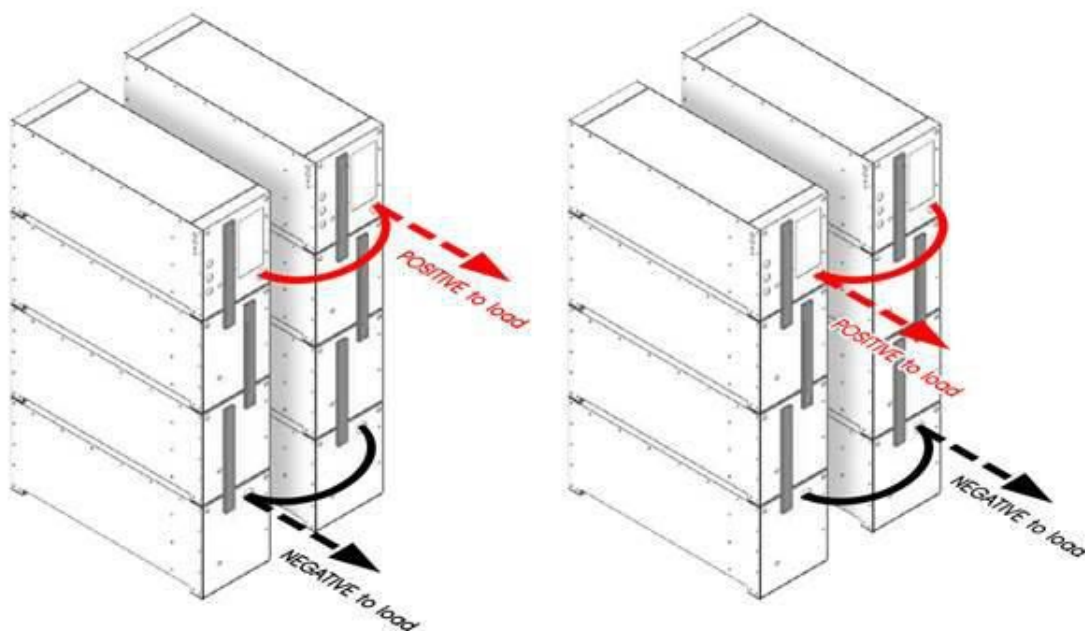
The installation procedure for serial integration varies and is determined by the serial-compatible peripheral hardware that is being integrated with.

3. PARALLEL CONNECTION

BlueNova batteries with 123Smart firmware version 5.4 & higher as well as BMMC firmware version 2.5 & higher include MultiCap™ technology. Batteries with MultiCap™ can be connected in parallel to each other to increase overall capacity, regardless of the age difference and/or rated capacity difference between any two of the batteries in the parallel configuration **ONLY IF ALL** of the requirements below are met:

- The nominal voltage of all parallel-connected batteries is the same (i.e. 52V), and
- The installed capacity @C2 of the largest battery in the parallel configuration is no larger than 4 x the installed capacity @C2 of the smallest battery in the same configuration, and
- The correct firmware versions are installed on all batteries in the configuration & updated accordingly, and
- Each battery is operating within its warranty period.

Parallel-connected battery configurations should always be connected to the inverter/charger from both ends of the configuration, as illustrated in either of the 2 x examples below:



4. MONITORING

4.1 On-Board Monitoring

Immediately after switching the battery on, the following splash screens will be displayed :

Splash screen 1:	BLUE NOVA energy BMMC v2.4	The BlueNova® logo is displayed, as well as the currently installed BMS firmware version.
Splash screen 2:	52V_6.5k_HC 52V_125_6.5 VICTRON 250	Line 1 & 2 : Abbreviated product/model information. Line 3: Inverter firmware details. Note: Victtron 250 is used for batteries installed without serial integration.
Splash screen 3:	Parallel Batteries N = 1	Displays the currently set parallel configuration. For single batteries not connected in parallel, N should be 1.

After the above splash screens have been displayed for a few seconds each, the display will settle on page 1 below. Press the **CTRL** button to scroll to the next page in sequence:

Page 1:	Vbat:53.14V Ibat:0.000A SOC :99.99%	>> Battery voltage (actual) >> Current (positive value = charge ; negative value = discharge) >> State-of-charge
Page 2:	Energy out: 0.446kWh SOH:99.99%	>> Total energy discharged from the battery since production. >> State-of-health
Page 3:	Vch: 3.325V Vcl: 3.320V VC info ->	>> The highest cell voltage measured over any single cell. >> The lowest cell voltage measured over any single cell. >> Cell voltage submenu. See next table below.
Page 4:	Tmax:20.00C MCU ID:321f	>> The average ambient temperature inside the enclosure(s). >> Unique micro-controller unit identification number.
Page 5:	State OK	The current state of the battery is displayed here. If State = Err please see F. TROUBLESHOOTING below.
Page 6:	FW:BMMC 2.4 G#:8eb7c95e PO:N=1 I=1	<< B attery M anagement & M onitoring C ontroller firmware ver. << Unique number used for debugging during production. << Currently set parallel configuration. See D. INSTALLATION
Page 7:	OVERRIDE? PRESS+HOLD	Override procedure prompt for recovery from over-discharge. See F. TROUBLESHOOTING > 2. Recovery from over-discharge

Individual cell voltages can be viewed by accessing the cell voltage submenu from page 3:

Page 3:	Vch: 3.325V Vc1: 3.320V VC info ->	Scroll to page 3 illustrated on left. The arrow in the last line VC info -> indicates a submenu. Press & hold the CTRL button for about 2 seconds to access this submenu.
Page 3.1:	Vc1: 3.320V Vc2: 3.320V Vc3: 3.321V	<< Cell 1 voltage (actual) << Cell 2 voltage (actual) << Cell 3 voltage (actual)
Page 3.2:	Vc4: 3.321V Vc5: 3.321V Vc6: 3.321V	<< Cell 4 voltage (actual) << Cell 5 voltage (actual) << Cell 6 voltage (actual)
Page 3.3:	Vc7: 3.321V Vc8: 3.321V Vc9: 3.321V	<< Cell 7 voltage (actual) << Cell 8 voltage (actual) << Cell 9 voltage (actual)
Page 3.4:	Vc10: 3.321V Vc11: 3.321V Vc12: 3.321V	<< Cell 10 voltage (actual) << Cell 11 voltage (actual) << Cell 12 voltage (actual)
Page 3.5:	Vc13: 3.322V Vc14: 3.322V Vc15: 3.322V	<< Cell 13 voltage (actual) << Cell 14 voltage (actual) << Cell 15 voltage (actual)
Page 3.6:	Vc16: 3.322V	<< Cell 16 voltage (actual)

Press the **CTRL** button again to jump back to page 3.1 above. Press & hold the **CTRL** button for 2 seconds to exit submenu & return to one of the main pages.

5. UPDATING FIRMWARE

You can update your battery's firmware locally (from a USB-connected laptop) or remotely (from a compatible internet-connected third-party device, such as a desktop PC, laptop or smartphone).

For firmware update procedures, kindly contact BlueNova Technical Support.

E. MAINTENANCE

1. General Guidelines

- Do not short circuit the battery terminals.
- Do not use the battery without a BlueNova® approved integrated BMS solution.
- Do not disassemble, pierce, cut or in any way physically alter any part of the battery.
- Do not burn, incinerate or otherwise subject the battery to extreme heat.

2. Storage Instructions

- Ensure that the battery is switched off when stored.
- Disconnect the communication cable.
- Always store batteries in a cool and well-ventilated area – ideally $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$.
- Store away from moisture and heat.
- Do not store batteries upside down for overly long periods.
- Check the open circuit voltage of stored batteries at least once per month. Recharge batteries sufficiently and frequently enough to prevent the open circuit voltage falling below 40V.
- Ensure that the stored battery's state of charge is always above 50%. 100% SOC is optimal.

F. TROUBLESHOOTING

All BlueNova® products contain integrated circuitry as a safety measure against possible damage from electrical malfunction. Under such conditions, one of the following errors will be displayed on the integrated OLED display. Please follow the procedure described in each case:

1. List of error messages

Error no.	Displayed:	Procedure:
Error 1:	State Err BmsCRCfail	Please contact BlueNova Technical Support. This error is used during production for debugging & should not be encountered in the field.
Error 2:	State Err BmsCelComs	Please contact BlueNova Technical Support. This error is used during production for debugging & should not be encountered in the field.
Error 3:	State Err BmsCommsTO	Please contact BlueNova Technical Support. This error is used during production for debugging & should not be encountered in the field.
Error 4:	State Err BmsBadData	Please contact BlueNova Technical Support. This error is used during production for debugging & should not be encountered in the field.

Error 5:	State Err Vcell OVER	1. Check inverter/charger settings. 2. Check & note all cell voltage(s), if possible. 3. Contact BlueNova Technical Support.
Error 6:	State Err VcellUNDER	1. Check inverter/charger settings. 2. Check & note all cell voltage(s), if possible. 3. Contact BlueNova Technical Support.
Error 7:	State Err +I _{i2t} OVER	1. Check inverter/charger settings. 2. Contact BlueNova Technical Support.
Error 8:	State Err -I _{i2t} OVER	1. Check inverter/charger settings. 2. Contact BlueNova Technical Support.
Error 9:	State Err Tcell HIGH	1. Check inverter/charger settings. 2. Contact BlueNova Technical Support.
Error 10:	State Err Tcell LOW	1. Check inverter/charger settings. 2. Contact BlueNova Technical Support.
Error 11:	State Err VprechFAIL	1. Check fuse(s) & terminal connections. 2. Switch battery off & disconnect from inverter/charger. 3. Switch battery on again. Reconnect to inverter/charger.
Error 12:	State Err Fuse Error	1. Check fuse(s) & terminal connections. 2. Power cycle the battery (switch off, then on again).

2. Recovery from over-discharge

BlueNova® batteries will automatically disconnect from the inverter/charger if the battery is over-discharged to the point that the cell voltage over any single cell reaches 2.85V. For BlueNova's 52V BR range, the integrated electronics that drive the OLED display will remain operational while the total battery voltage remains above 40V (2.5V x 16 cells).

If an over-discharged battery's total voltage falls below 40V, the battery will automatically enter **DDL** (Deep Discharge Lockout) mode. Recovery from DDL mode might still be possible, depending on how long the battery has remained in this state. Please contact BlueNova Technical Support in such cases.

If an over-discharged battery's display is still operational, the battery can be recovered from this state by following the procedure below:

Page 7:	VERRIDE? PRESS+HOLD	Navigate to the page on the left by pressing the CTRL button. Ensure that the battery will be charged upon reconnecting.
Override Confirmation Page:	VERRIDE * IS * ACTIVE	Press & hold the CTRL button to initiate the override procedure. The display will jump between the one illustrated on left and the main page (page 1) below.
Page 1:	Vbat:41.14V Ibat:0.000A SOC :0.00%	Verify that the battery is being charged by checking that the value for Ibat on the display is positive. Once the battery's contactor can be heard closing, the CTRL button can be let go.

G. EMERGENCY & FIRST AID

1. In case of fire

- Evacuate danger zone. Open ventilation in the room if possible.
- Extinguish fire with a CO2 fire extinguisher.
- After the fire has been extinguished, immerse any remaining smoking cells completely in water. Wear protective gear during this procedure.

2. Skin contact

- Wash the affected area immediately with soap and water.
- If irritation persists, seek medical attention.

3. Eye contact

- Rinse eyes immediately with clean water continuously for at least 15 minutes.
- Seek medical attention immediately afterwards.

4. Ingestion

- Refrain from taking any emetic or vomit-inducing medicine.
- Seek medical attention immediately.