



5. Safety

CAUTION

 **DANGER - HIGH CURRENT HAZARD!**

 Never touch the power terminals as the module can be charged and cause fatal electrical shocks. Always check that the module is fully discharged before manipulating the module. Please refer to the step by step instructions in the Safety section of this manual for the manual discharge procedure.

- Do not operate unit above specified voltage.
- Do not operate unit above specified temperature rating.
- Do not touch terminals and exposed conductors while charged. Serious burns, shock, or material fusing may occur.
- Protect surrounding electrical components from incidental contact.
- Provide sufficient electrical isolation when working above 50VDC.
- Do not operate on conductive surfaces unless proper insulation is in place for exposed conductors.

CAUTION

 A fully discharged module may “bounce back” if it is stored without a shorting wire connected to the + and - terminals. This bounce back can be as much as 15V for the 125V module, and is enough to cause dangerous electrical shocks.

5.1. Proceed as follow to discharge the module:

Using a voltmeter, measure the voltage between the two terminals.

If the voltage is above 2V, a resistor pack (not supplied with the module) will need to be connected between the terminals. Proper care needs to be taken in the design and construction of such a dissipative pack. e.g. At 125V, for a 4 Ohm pack, the module will be discharged with a current of 31.25A and will take about 20 minutes to fully discharge. However, in this case, the heat/power dissipated in the resistor pack will be ~3.9kW. The resistor pack will need to be sized and provided with suitable cooling to handle this power dissipation. Additionally, proper enclosure or other packaging is necessary to ensure safety. In all cases, proper design of the dissipative resistor pack is necessary.

If the voltage is under 2V, connect the shorting wire provided by Tecate Products to the + and - connectors.

The module is now safe for handling. However, leave the shorting wire connected **at all times** until the module is installed and the power cables are connected.

6. Maintenance

Periodically check the main power terminal connections. Re-tighten the terminal bolts as necessary.

Prior to any handling, ensure module is completely discharged. **The stored energy and the voltage levels may be lethal if mishandling occurs.**

7. Storage

The module can be stored in the original package discharged in a dry place. Discharge used module prior to stock or shipment. A wire across the terminal may be used to maintain short circuit after having discharged the module.

8. Disposal

Do not dispose of module in trash. Dispose of according to local regulations.

9. Specifications

Refer to data sheets on our website, www.tecategroup.com, for specifications for each specific product.

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Refer to our website www.tecategroup.com for full terms and conditions.	



USER MANUAL

Tecate Group Powerburst Energy Storage Modules

User Manual for Maxwell[®] BCAP0650 & BCAP3000 cell Modules:

BCAP0650 Cell:

- **PBM-325/5.4, 1x2**
- **PBM-108/16.2, 1x6**
- **PBM-108/16.2, 2x3**
- **PBM-54/32.4, 3x4**
- **PBM-54/32.4, 2x6**
- **PBM-36/48.6, 3x6**
- **PBM-36/48.6, 2x9**
- **PBM-27/64.8, 4x6**
- **PBM-27/64.8, 3x8**

BCAP3000 Cell:

- **PBM-1500/5.4, 1x2**
- **PBM-500/16.2, 1x6**
- **PBM-500/16.2, 2x3**
- **PBM-250/32.4, 3x4**
- **PBM-250/32.4, 2x6**
- **PBM-166/48.6, 3x6**
- **PBM-166/48.6, 2x9**
- **PBM-125/64.8, 4x6**
- **PBM-125/64.8, 3x8**

CAUTION

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Warranty Limitation: Do not disassemble or modify the module. Modified modules are not covered by warranty.

1. Introduction

The PBM series energy storage modules are energy storage devices comprised of different numbers of individual ultracapacitor cells. The modules include buss bar connections, and integral voltage management circuitry. Units may be connected in series to obtain higher operation voltages, parallel to provide additional energy storage, or a combination of series/parallel arrangements for higher voltages and energy. There is a voltage management circuit that functions primarily to protect every cell from operating in a damaging over voltage condition.

The cells are assembled using the patented interlocking end caps to provide rigidity in various form factors.

2. Unpacking

Inspect the shipping carton for signs of damage prior to unpacking the module. Damage to the shipping carton or module should be reported to the carrier immediately.

Remove the module from the shipping carton and retain the shipping materials until unit has been inspected and is determined to be operational.

NOTE: The original shipping materials are approved for both air and ground shipment. The module should be removed from the shipping carton by lifting it by the module body and not the battery posts.

The shipping container should contain one energy storage unit, and one user manual.

If the unit is found to be defective or any parts are missing, contact your supplier. A Return Material Authorization (RMA) number must be issued prior to returning the unit for repair or replacement.

3. Installation

3.1. Mechanical

Modules are mountable and may be operated in any orientation. Mounting holes are available on all sides of the modules and at the top and bottom surfaces. When fastening the module to another surface using fasteners, one must be cautious not to damage the cells with the fastener. The end cap are designed to be used with 0.09" thick sheet metal plates and #8x3/8" self tapping screws.

3.2. Electrical

CAUTION

⚠ To avoid arcing and sparking the energy storage module should be in a discharged state and the system power disconnected during installation. The module is shipped discharged and with a shorting wire. Shorting wire should be removed prior to electrical connections. For more information about the discharge procedure, please refer to Section 5, Safety.

CAUTION

⚠ To provide the lowest possible ESR the energy storage modules are not fused. Care should be taken within the application to prevent excessive current flow as required. Excessive current and/or duty cycle will result in overheating the module which will cause irreparable damage. Please consult the data sheet for current and duty cycle capabilities.

3.2.1 Output Terminal Posts

The output terminals of the module are SAE battery posts. They are designed to connect directly to SAE battery clamps. Apply a layer of anti-oxidant joint compound (high conductivity aluminum-aluminum. For example, Noalox Anti-Oxidant Compound available from IDEAL is a viable choice. There are many other vendors that supply equivalent compounds.) between the mating surfaces prior to installation of the clamps. Tighten the hex bolts on the battery clamps sufficiently for a low ESR connection.

Attachments to the output terminals should be made with battery cables of an appropriate size for the application current. The energy storage module has a low ESR. As a result, the resistance of the wires connecting the energy module to the application can easily exceed the ESR of the module.

Connection of modules in series or parallel should utilize the same gauge wire as determined for final output connections. When connecting in series, connect the positive output terminal of one module to the negative output terminal of the next module. Two possible orientations are illustrated in Figure 1.

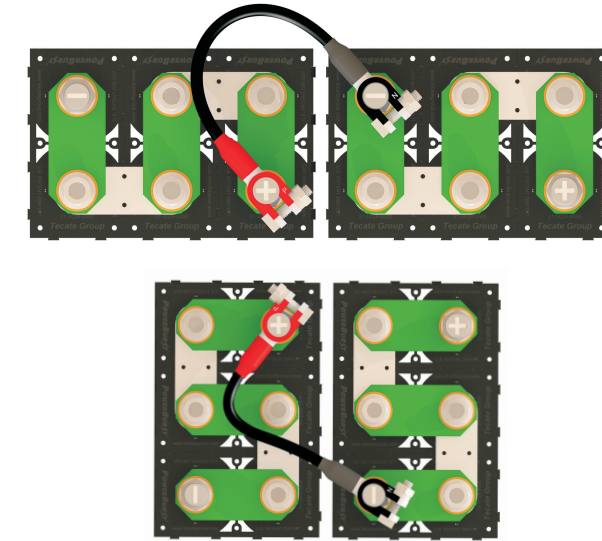


Figure 1: Possible series connection arrangements.

When several modules are connected in series for operating at high voltage, care must be taken to ensure proper creepage and clearance distance in compliance with national safety standards for electrical equipment.

When connecting modules in combination of series and parallel, the series string should be interconnected first. The parallel connections will be made at the end points of the series string at the negative-to-negative and positive-to-positive battery posts.

3.2.2 Module to module Connections

The PBM modules are equipped with the active voltage management circuit that protects and monitors every cell within the module. Module-to-module balancing is not required.

Each individual cell voltage is monitored by the management circuit. Each cell is protected from entering an over voltage condition. If any cell does experience an over voltage condition, the corresponding LED will illuminate and the active circuitry will begin to discharge that cell. Once the cell is back within nominal operation voltage limits, the LED will extinguish.

Voltage management circuitry does not prevent an individual capacitor or series of capacitors from over voltage condition if prolonged charging to a higher than specified voltage persists (2.7V/cell). Provisions should be made with the system integration to prevent prolonged over voltage conditions.

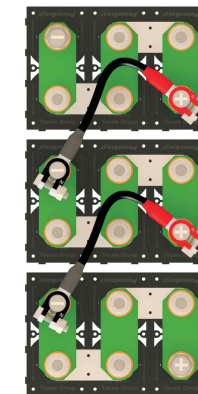


Figure 2: Series connection of modules.

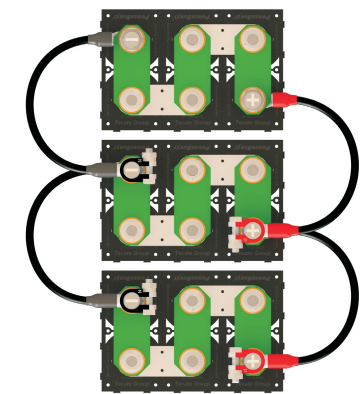


Figure 3: Parallel connection of modules.

4. Operation

Module should only be operated within specified voltage and temperature ratings. Determine whether current limiting is necessary on input/output based on current ratings of ancillary devices. Observe polarity indicated on module. Reverse polarity operation of the module(s) is not recommended.