# Azure's Ultracapacitor Bank

## UCB42

## Overview

The Azure UCB42 is a fully packaged, 18kW, thermally managed, ultracapacitor bank. Used with the Azure DC345 ultracapacitor controller, it provides a state-of-the-art solution to the problem of onboard energy management. This high-power "solid-state" energy storage system, ideal for electric and hybrid vehicles, improves vehicle efficiency AND performance. Superior vehicle acceleration and the enhanced re-capture of regenerative braking energy permit the use of reliable, long-life, low-cost batteries, or in some cases, the elimination of batteries altogether. It provides an excellent combination of power capability, energy capacity, with low initial and life cycle cost.

## Applications

- **Heavy-duty hybrid & electric vehicles –** including: diesel engine, turbine, heat-engine, fuel cell and pure electric (battery and catenary)
- **Ultracapacitor load-leveling system –** allows ultracapacitors to provide power bursts for vehicle acceleration and absorb power burst from regenerative braking
- **Ultracapacitor solid-state pulse power system –** provides high power bursts of energy without any moving parts or batteries requiring maintenance

## Features

- High-current, low-loss construction
- Terminal box connection
- Modular self-contained unit with controls
- Control interface via analog and digital signals, CAN bus, or RS232 **–** all available when used with DC345 controller
- Rugged, lightweight aluminum chassis
- Automatic air-cooled thermal management
- The combined ultracapacitor/battery/DC-DC system allows full energy use of the ultracapacitor bank while maintaining a consistent total system voltage.

## Safety Features

- Automatic cell balancing
- Over-temperature protection
- *When used with the DC345 Controller for external control.*
- Temperature signal outputs
- Automatic thermal management

## Preliminary Specifications

| | UCB42 |
|---|---|
| **Dimensions** | 403mm x 300mm x 232mm |
| **Weight** | 19.5kg (43lb) |
| **Number of Ultra-Caps** | 18 |
| **Maximum Current** | 400A |
| **Fuse Rating** | 250 A |
| **Maximum Voltage** | 45V |
| **Min/Max Operating Temps** | -40C to 65C |
| **Efficiency (typical, full cycle)** | Approx. 85% w/DC345 |
| **Energy Content** | 41.6 Wh |
| **Usable Energy (VDC: 100%-30%)** | 35 Wh |
| **Capacitance** | 150 Farads |
| **Voltage Limit** | 500 Volts |
| **Fan Intake Air Flow** | 44 **–** 50 CFM |
| **Peak Power** | 15.7 kW @ 400 A<br>14 kW @ 350 A |

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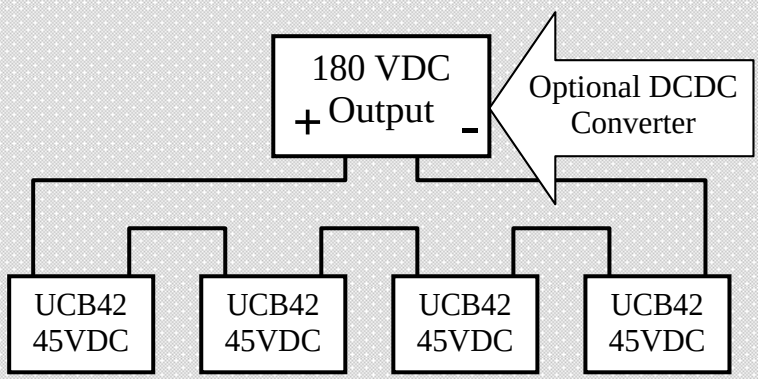
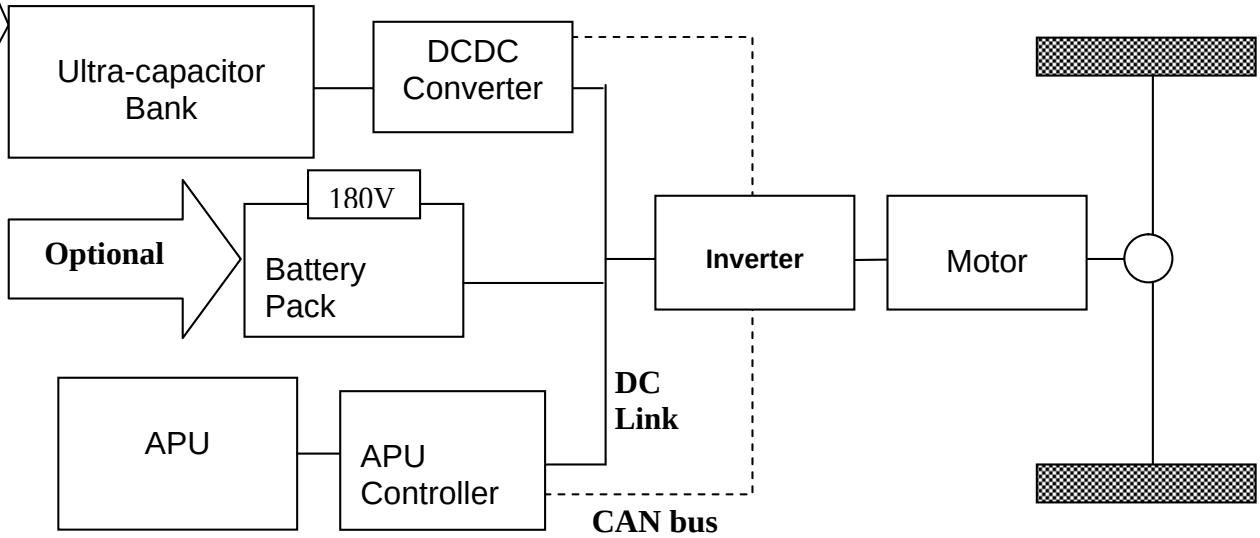
## Connection Examples for Ultracapacitor Banks




| 4 Series | 4 Series 2 Parallel |
|---|---|
| **4 x UCB 42**<br>• 140 Wh<br>• 180 VDC<br>• 400 A peak<br>• 62.8kW peak | **8 x UCB 42**<br>• 280 Wh<br>• 180 VDC<br>• 800 A peak<br>• 125kW peak |

Resistive losses @ Peak Current = 400 A * .0008 ohm * 18 cells * 4 banks = 23 Volts

Schematic of hybrid electric vehicle propulsion system, including ultracapacitor (battery load-leveling), battery pack and auxiliary power unit (APU).




**Peak Bank Allowable Current for a 200A (Actual 250A), 500V fuse**

| | |
|---|---|
| 1000 sec = 250 Amps | .1 sec = 875 Amps |
| 100 sec = 400 Amps | .01 sec = 1010 Amps |
| 10 sec = 550 Amps | .001 sec = 2000 Amps |
| 1 sec = 750 Amps | |

(Values are Conservative)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