Bravo Zulu International Ltd.

Los Angeles, California USA

Automated Battery Impedance Testing in Cell Tower Operations using the BattRecon Model 5000C

BZI engineers have developed the world's first, real time battery health indicator testing systems specially designed for automated cell tower usage. The system is an integral part of our newest technology, the Cell Tower Battery Automatic Optimization and Diagnostics System, found within the Model 5000C operating system.

The system's design is simple; the Model 5000C is physically integrated within the cell tower electronics rack and connected to the battery banks using external wires and connectors. The Model 5000C size will allow it to fit in a self enclosed chassis of 10 inches tall, 16 inches wide, and 15 inches deep, or per the operator's requirements.

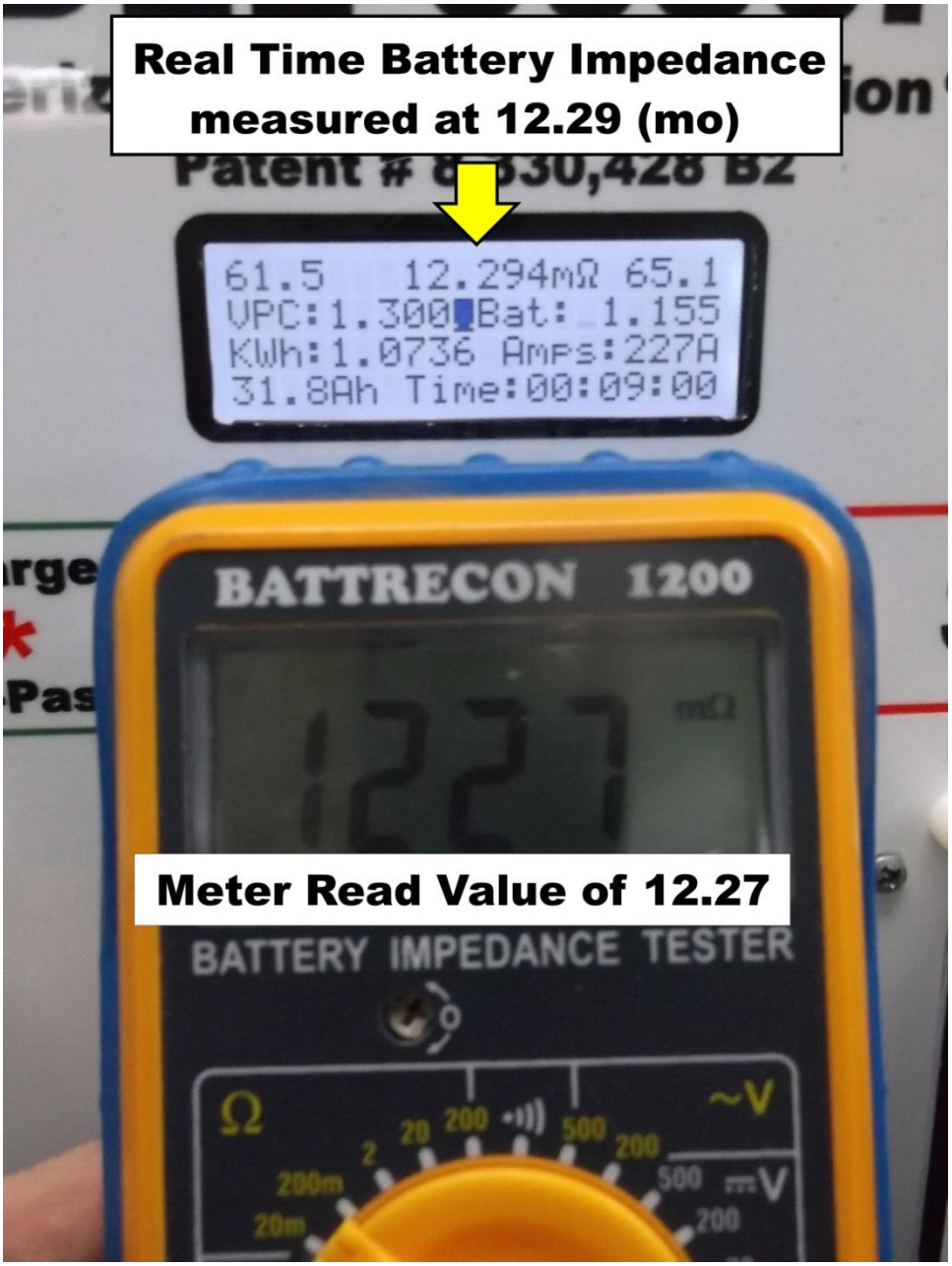
When the automatic optimization of the batteries is scheduled, the Model 5000C interrupts the battery to cell tower charging power supply connections, alternatively, one bank at a time; then applies a few minutes of our Patented BattRecon Process to that isolated battery bank. Once the battery is optimized, the Model 5000C applies an impedance testing algorithm to the batteries and transmits the data using the cell tower data bus.

An example of the impedance data measured in Milli-ohms is found on page two. In this photo the load bank discharge test was interrupted so the numbers would remain static, but you can see the milliohms reading on the upper center of the display is nearly identical to the calibrated Model 1200 impedance tester.

The operator determines the testing and optimization interval suited for their batteries, programming the systems once integrated into the cell tower. Using the onboard WIFI systems, or other communication means, the Model 5000C will transmit periodic data reports including the impedance (Battery Health) of the battery systems.

In addition to automated optimization and battery health reporting, the operator can remotely switch to Manual Mode and individually test and optimize any battery bank within their network. The operator will simply select the cell tower to work with , then select the Manual Mode of operation for either BattRecon, or the Battery Health Diagnostics Mode.

As an example, let's say that the operator in Los Angeles wanted to test the batteries within a cell tower located on top of a volcano near Mexico City. Using a network connection provided by the cell tower network, the operator could open up the menu of the remote Model 5000C system, select Manual Mode, then Battery Health testing and receive in only a few seconds the Battery Health measured in milli-ohms.



If the serviceability standard was known as a maximum impedance of 34 milli-ohms, as an example, and the battery measures 38 milli-ohms; then the operator would know that the batteries need service or replacement. Furthermore, if the operator wanted to optimize the battery banks they could do so in Manual Mode, by simply selecting the BattRecon mode and waiting a few minutes for the cycle to finish. Once optimization is complete, the operator would then select the Battery Health Manual Mode function again and retest the battery bank.

In conclusion, Battery Optimization techniques and reported impedance values may be used in Battery Performance Trend Analysis. This will greatly reduce service labor and transportation costs related to battery testing and analysis. Optimization adds several years of life expectancy to the battery, while reducing the daily electrical consumption of the batteries during charging. Finally, impedance trend analysis allows the operator to accurately determine the current status of the Battery Health, in addition to predicting the remaining life of their batteries.