

## Background

Devices that process information (data storage equipment) may either access a separate portable (removable) recording medium or a permanent component to store or retrieve information.

Electronic data storage is storage that requires electrical power to store and retrieve data. Most storage devices that do not require visual optics to read data fall into this category. Electronic data may be stored in either an analog or digital signal format. This type of data is considered electronically encoded data, whether or not it is electronically stored. Most electronic data storage media is considered permanent (non-volatile) storage, that is, the data will remain stored when power is removed from the device. In contrast, electronically stored information is considered volatile memory.

Organizations using a data storage system have the same things in common: they require the system to be reliable, be available, and provide the performance as specified. The storage system designer and manufacturers are also have commonalities: designing for continuous availability, designing for expansion, and designing for agency compliance, speed and flexibility.

## Problem

**A leading designer and manufacturer of data storage units was faced with some new challenges:**

- Customers requiring more data security including longer power back-up times to deal with potential long-term power losses.
- Along with extended time, the power back up must be more reliable and stable. The old adage “I need it when I need it” applies. However, “I need it stable, and to last longer, and be more environmentally friendly too” has been added to the mantra.
- Increased data storage capacity requirements were leading to reduced space availability for the conventional power backup system. A more compact and even portable alternative was required.
- Environmental regulations, including RoHS and WEEE compliance requirements, were driving the search for alternative power backup technologies.

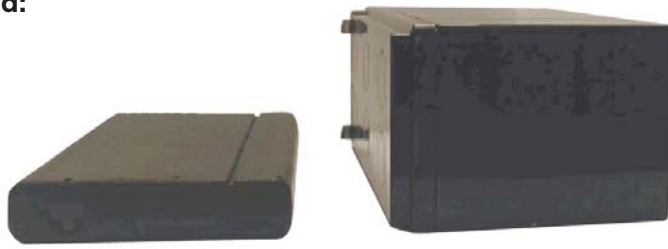


## Solution

**Application: Battery Module for the server**

- 9 cell 18650 Li-Ion battery pack (2 per server) was designed to replace the conventional lead-acid system
- Battery module includes a means for providing Vital Product Data (VPD) over a conventional Inter-Integrated Circuit (I2C) bus
- The pack is RoHS/WEEE compliant. The customer was able to take advantage of TEBS UL certified testing facility for fast turn-around time.
- Minimum holdup time of 3 days provided for 1GB DDR-I DIMM under typical conditions.
- Switching regulator for battery charging was designed.

## Lithium Ion vs. Lead Acid:



Battery Comparison	Replacement Lithium Ion 3S3P 18650 Cell, 10.8V, 6.6Ah Pack	Existing Sealed Lead Acid Battery 12V 6.3Ah	In comparison, a Lithium Ion Battery has
Pack Operating Voltage (V)	10.8	12	10% less pack voltage
Pack Capacity (Ah)	6.6	6.3	5% more pack capacity
Watt-Hours per Pack	71.28	75.6	6% less watt hours
Pack Weight (oz.)	13.41	87.2	85% less weight
Pack Minimum Voltage (V)	9	10.5	14% less min voltage
Pack Maximum Voltage (V)	12.6	14.9	15% less max voltage
Mechanical Dimension (mm)	140 x 88 x 20*	151 x 94 x 64.5**	
Total Cubic Volume (mm)	246,400	915,513	73% less volume
Total Watt-Hours per mm <sup>3</sup>	0.00029	0.00008	250% more watt hours per mm <sup>3</sup>
Total Watt-Hours per oz.	5.32	0.87	513% more watt hours per oz.

\* includes plastic case

\*\* does not include terminal height

## Result / Outcome

### TEBS value in Storage: Full turnkey solutions:

- Smart circuit - Firmware that communicates back to the unit
- Form, fit, functional multi-cell design - to meet the application requirements
  - using 73% less space and 85% less weight with more overall capacity (Ah) by replacing connection lead acid with Li-ion
- Understand very complex circuits, functions, and programs
- Considerably less total heavy metal, leading to RoHS and WEEE compliance
- Application expertise
  - Engineering expertise to understand complex design and functional needs

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