5V-POWERED MULTI-FORM FACTOR LITHIUM-ION AUTOMATED CELL TESTER WITH USB INTERFACE

FEATURES
- **Measures Voltage, Temperature, Current, and Impedance with High Accuracy**
- **Offers User the Ability to Construct Unique, Automated Cell Tests**
- **Exceedance Thresholds Protect Cells from Overcurrent and Overtemperature**
- **Software Algorithm Reports Optimal Pairing of Tested Cells**
- **Open Source Software Supports Application Specific Modularity**
- **Nominally Compatible with 18650 Form Factor Cells**
- **External Cell Connectors Support Other Form Factors**

APPLICATIONS
- **Battery Pack Assembly**
- **Lithium-Ion Cell Binning and Recycling**
- **Automatic Test Equipment**
- **Portable Data Acquisition Systems**

DESCRIPTION

The Lexcelon Batlab v1.0 is designed to collect voltage, current, temperature, and impedance measurements of up to 4 Lithium-ion cells simultaneously. The device is controlled by register transactions that are initiated by user-constructed test commands passed to the Batlab through a USB connection from a host PC. The charging and discharging of cells can be controlled at constant rates or by using sinusoidal charge or discharge waveforms. Measurements are continuously taken by the device, and if a safety limit is reached, all current flow is stopped.

Batlab software that accompanies the hardware offers a test suite from which a user may construct unique, automated tests for a batch of cells. A user-friendly test wizard guides users through the process of setting test registers for threshold limits and test duration. When testing is complete, a software algorithm uses the high-accuracy data collected from the cell batch to determine the optimal pairing for compliance with user defined constraints such as capacity and battery pack weight. Multiple Batlabs units may be used for data collection simply by connecting the units to additional USB ports on the host PC.

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SPECIFICATIONS

VOLTAGE MEASUREMENT					
PARAMETER	**TEST CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
Measuring Scheme	Voltage measured with 13 Bit Differential ADC (MCP3304) over SPI interface				
Sampling Rate			10		kHz
Resolution	Oversampled by 10 Bits and averaged to 16 Bit (signed) value		16		Bits
Reference	External		4.5		Volts
Absolute Error (Uncalibrated)	No factory calibration present for correction of linear deviations	-2		2	mililVolts
Absolute Error (Calibrated)	Unit calibration is performed upon assembly for correction of linear deviations	-0.5		0.5	milliVolts
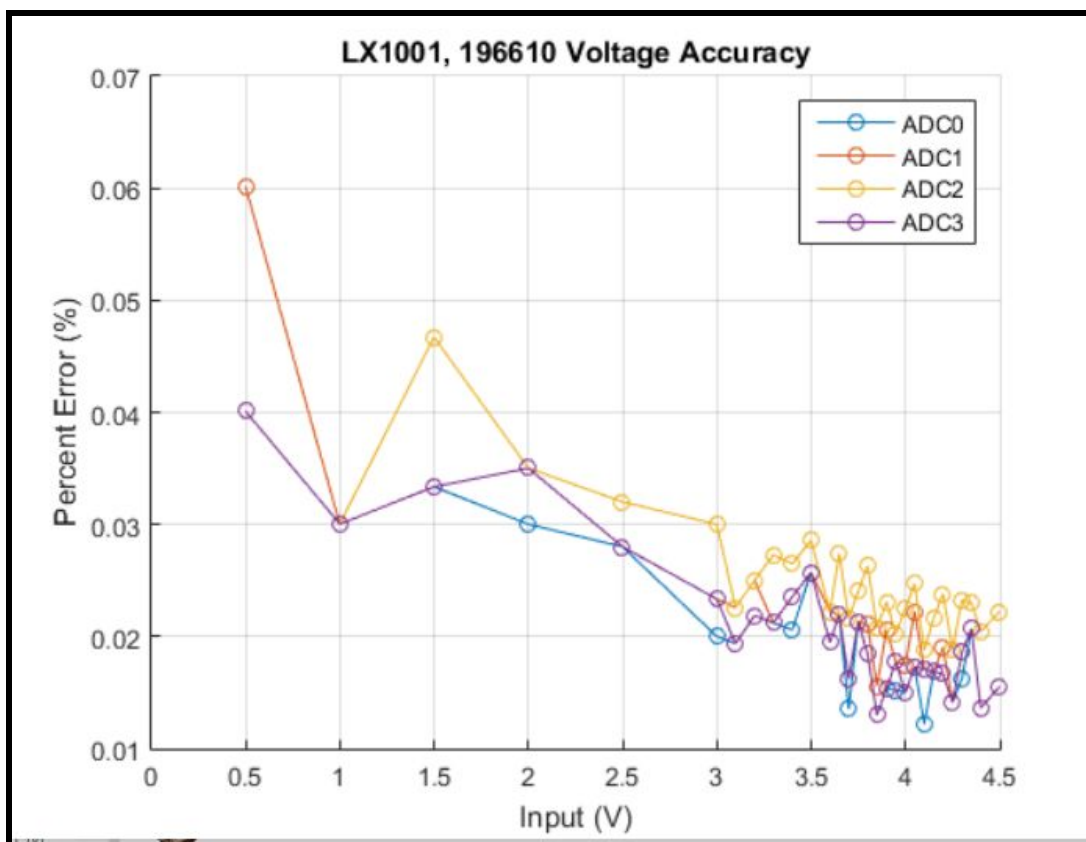
TEMPERATURE MEASUREMENT					
PARAMETER	**TEST CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
Measuring Scheme	Temperature measured with 10 Bit ADC that samples a Thermistor / Resistor divider				
Sampling Rate			10		kHz
Resolution	Oversampled by 10 Bits, and averaged to 15 Bit value		15		Bits
Reference	Divider is USB powered and ADC uses USB reference		5		Volts
Absolute Error (Uncalibrated)	No factory calibration present for correction of linear deviations	**TBD**	**TBD**	**TBD**	Deg Celsius
Absolute Error (Calibrated)	Unit calibration of B constant and resistor divider is performed upon assembly for correction of linear deviations	**TBD**	**TBD**	**TBD**	Deg Celsius

CURRENT MEASUREMENT					
PARAMETER	**TEST CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
Measuring Scheme	Current measured with 10 Bit ADC that samples from a Gain 50 shunt amplifier reading voltage across a 1% 20mR Shunt Resistor				
Sampling Rate			10		kHz
Resolution	Current measured through 1% 20mR Shunt Resistor with a gain of 50 applied through a shunt amplifier		16		Bits
Reference	External (1V = 1A)		4.096		Volts
Absolute Error (Uncalibrated)	No factory calibration present for correction of linear deviations	**TBD**	**TBD**	**TBD**	milliAmps
Absolute Error (Calibrated)	Unit calibration is performed upon assembly for correction of linear deviations	**TBD**	**TBD**	**TBD**	milliAmps
CURRENT SYNTHESIS					
Generating Scheme	Current is controlled by a MOSFET. An Op-Amp circuit is used to translate a current command into a 100 kHz PWM gate voltage in the 0-5V range. A 2nd order passive filter removes the PWM switching component and results in a command resolution of 128 steps per Amp.				
PWM Range		0		5	Volts
PWM Frequency			100		kHz
PWM Resolution			640		CNT
Current Resolution			128		Steps / Amp

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SINUSOID SYNTHESIS					
PARAMETER	**TEST CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNIT**
Generating Scheme	Sinusoidal waveforms can be generated overtop of the PWM current command output using a 256 point look-up table.				
Frequency Range		39.0625		1250	Hz
Frequency Gen. Step Size			39.0625		Hz
Frequency Accuracy		-300		300	ppm
IMPEDANCE MEASUREMENT					
Measurement Scheme	Phase difference between voltage and current sine wave is reported				
Reporting Precision	f is the sine wave frequency	$\dfrac{(256\ CNT)(39.0625Hz)}{360\ degrees * f}$			CNT / degrees
Peak-to-Peak Voltage Resolution			12		Bits
Peak-to-Peak Current Resolution			10		Bits
Error (Uncalibrated)		**TBD**	**TBD**	**TBD**	%
Error (Calibrated)		**TBD**	**TBD**	**TBD**	%

ABSOLUTE HARDWARE RATINGS

	RATING	DESCRIPTION
Maximum Current Measurement (Per Channel)	4.096A	Each channel is capable of measuring up to 4.096A, but is limited by the Thermal Dissipation Limit
Thermal Dissipation Limit (Per Channel)	4A	The Thermal Dissipation Limit imposes a 4A per channel maximum charge and discharge threshold.
External Power Supply	Surge: 12V Normal Operation: 4.3V - 5.3V	Charging and discharging operations of the device require a 5V external power supply. Units are rated to work with external power in the range 4.3 - 5.3V. Units are tolerant to surges of external power supply voltage up to 12V, but values beyond this may result in irreparable damage to the unit.
USB Reference	4.95V - 5.05V	A powered USB hub is recommended for device usage. A hub is required for multi-Batlab configurations. Device is designed for USB 2.0 (up to 400 mA draw per Batlab Unit).
Other Considerations		Processors are powered from the USB. In the event that USB experiences a power interruption, the cell current stops. The charge or discharge state does not recover upon restart.

DIMENSIONS

ORDERING INFORMATION
Models and descriptions are summarized in the table below. For the most current package and ordering information, please visit www.lexcelon.com.

MODEL	DESCRIPTION	ORDERING NUMBER
LX1001	Lexcelon Batlab V1.0	