# Laboratory Battery Testing System For Module Applications upto 60V

## Standard Models

| |
|---|
| LBT 25V - 10A |
| LBT 25V - 20A |
| LBT 25V - 50A |
| LBT 25V - 100A |
| LBT 40V - 20A |
| LBT 40V - 75A |
| LBT 40V - 150A |
| LBT 60V - 15A |
| LBT 60V - 50A |
| LBT 60V - 100A |

## Product Description

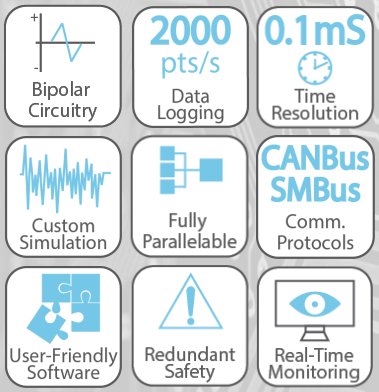
Arbin's Laboratory Battery Testing (**LBT**) series offer industry-leading hardware with high-precision measurements and high-frequency data sampling. Software flexibility gives users full control over the system to handle even the most complex research experiments or real-world test applications. Technology engineered for LBT was commercialized from a successful ARPA-E project for which Arbin and its industry partners Sandia Nat'l Lab and Ford won an R&D 100 award. Arbin's LBT provides **true bipolar circuitry** to ensure cross-zero linearity with no switching time between charge and discharge. We invite battery researchers and engineers to compare our I/V control performance and see for themselves why it is trusted around the world more than any other tester.

## Product Highlights

- Each channel provides three or four current ranges with industry-leading **0.02% accuracy**.
- Powerful **embedded controllers** provide ultra-fast data logging (up to 2000pts/sec, per system).
- Easily simulate custom **EV drive profiles** or **stationary grid storage profiles** without complicated scripts.
- **Fully parallelable** so any number of channels can be connected to increase the current handling capability.
- **Dynamic data acquisition** based on changes in time, voltage, and current to capture more data when it's needed and maintain efficient file sizes.
- Full set of **auxiliary options** for cell monitoring, temperature monitoring, environmental chamber control, and more.


## Primary Applications

- Module and Pack Life Cycle Testing
- Simulate Dynamic Real World Test Profiles
- Test & Qualify Battery Management System (BMS) via CANBus
- Smart Battery Testing via SMBus




**"We did side-by-side comparisons of Arbin and other tester technology. Armed with this data, we moved forward with confidence using Arbin for what is critical to our electrification future [EV]."**

— T. Miller, Ford Motors

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# Experts in Test Instrumentation

We re-defined what comprises state-of-the-art test equipment is during our **3-year ARPA-E project** with **Ford Motors** and **Sandia National Laboratories**. We use premium reference meters and shunts representing the global standard for metrology. Arbin has all the tools necessary to develop testing circuits beyond the old industry standards, and under a wide range of environmental conditions. This allows us to have a proper understanding of instrument performance and deliver the best possible product to our customers around the world.

**"Arbin testers generate high confidence data you can rely on, and provide the most comprehensively safe testing environment."**

**How We Treat Safety as Top Priority:**

- Each system has a fully redundant microcontroller dedicated to monitoring internal communication, and voltage - current safety limits.
- Testing schedules utilize global safety limits for voltage, current, power, and temperature (if auxiliary is present).
- Logic-driven scheduling interface allows for additional safety layers based on real-time measurements and external inputs such temperature, current, or voltage measurements.
- All test equipment has multiple failsafe's of internal fusing and over-temperature control measures.
- Communicate with internal battery management system (BMS) via SMBus, CANBus, or other protocol. Verify smart circuitry readings and functionality.
- Current - Voltage control automatically adjusts for changing internal resistance to always maintain safe control of the charge/discharge regime.
- Optionally interface control with most 3rd party temperature chambers.

3-year ARPA-E project to Develop a true high precision testing system for currents up to 200A! We scaled down technology for low current applications.

Arbin + leading industry partners: Ford Motors, Sandia National Laboratories, and Montana Tech completed ARPA-E, high-precision tester project.

2016 R&D 100 WINNER

Technology learned during this project has revolutionized Arbin's products, which has resulted in the **highest precision testers** commercially available on the market.

**"High precision measurements are not the only answer to understanding battery life, but it is a key component. Sandia National Lab brings their expertise in metrology and precision measurements and has helped Arbin as they've designed the new series of testers."**

— S. Ferreira, Sandia

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# Available Auxiliary Options

Select from the options below to expand the capability of your LBT system.

**Cell Voltage Monitoring**

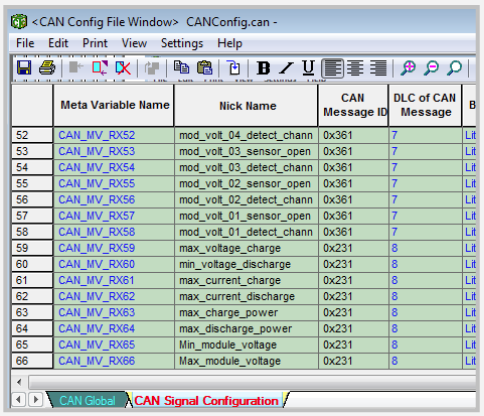

This option adds auxiliary voltage measurement inputs to monitor cells within a module or pack.

**Temperature Measurement**


Thermocouple or Thermistor inputs used to record temperature as well as be used control the test schedule.

**CANBus / SMBus**


The CANBus and SMBus options allow the Arbin system to communicate with a battery management system inside a module or pack. It will both send and receive CAN and SMBus messages to the device under test. There are no 3rd party DLL packages or licenses required.




| | Meta Variable Name | Nick Name | CAN Message ID | DLC of CAN Message | B |
|---|---|---|---|---|---|
| 52 | CAN_MV_RX52 | mod_volt_04_detect_chann | 0x361 | 7 | Lit |
| 53 | CAN_MV_RX53 | mod_volt_03_sensor_open | 0x361 | 7 | Lit |
| 54 | CAN_MV_RX54 | mod_volt_03_detect_chann | 0x361 | 7 | Lit |
| 55 | CAN_MV_RX55 | mod_volt_02_sensor_open | 0x361 | 7 | Lit |
| 56 | CAN_MV_RX56 | mod_volt_02_detect_chann | 0x361 | 7 | Lit |
| 57 | CAN_MV_RX57 | mod_volt_01_sensor_open | 0x361 | 7 | Lit |
| 58 | CAN_MV_RX58 | mod_volt_01_detect_chann | 0x361 | 7 | Lit |
| 59 | CAN_MV_RX59 | max_voltage_charge | 0x231 | 8 | Lit |
| 60 | CAN_MV_RX60 | min_voltage_discharge | 0x231 | 8 | Lit |
| 61 | CAN_MV_RX61 | max_current_charge | 0x231 | 8 | Lit |
| 62 | CAN_MV_RX62 | max_current_discharge | 0x231 | 8 | Lit |
| 63 | CAN_MV_RX63 | max_charge_power | 0x231 | 8 | Lit |
| 64 | CAN_MV_RX64 | max_discharge_power | 0x231 | 8 | Lit |
| 65 | CAN_MV_RX65 | Min_module_voltage | 0x231 | 8 | Lit |
| 66 | CAN_MV_RX66 | Max_module_voltage | 0x231 | 8 | Lit |

**3rd Party Chamber Interface**


Interface with a 3rd party temperature chamber so Arbin software can turn chamber on/off and adjust temperature.


**UPS**

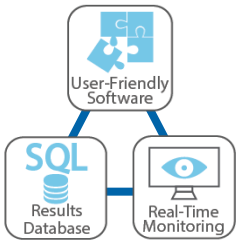

Uninterrupted power supply for PC so tests can resume automatically after brief power outages.

**Digital & Analog Input/Output**


Digital: Send and receive a simple on/off signal to interact with external devices.

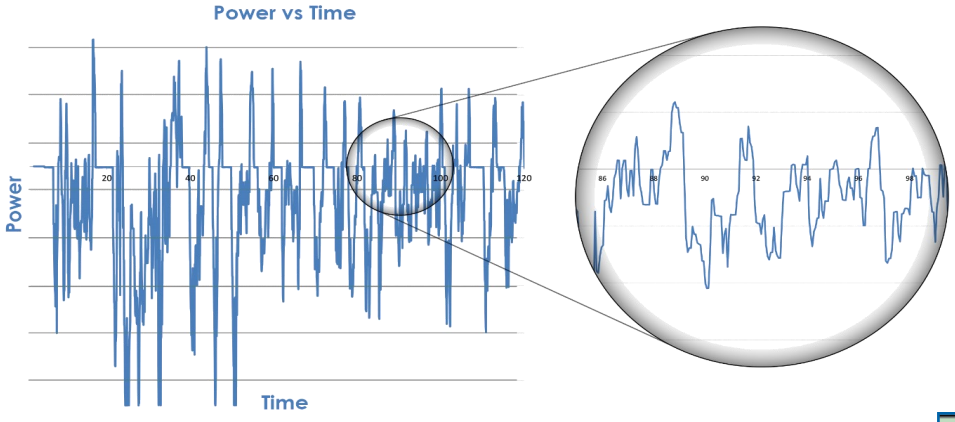
Analog: Send and receive a 0-10V signal to operate 3rd party devices.

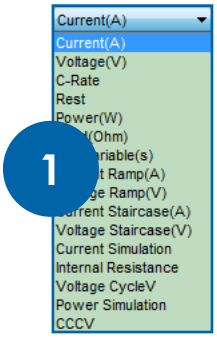
# Software Suite

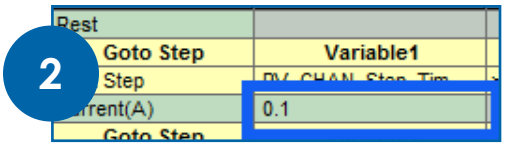


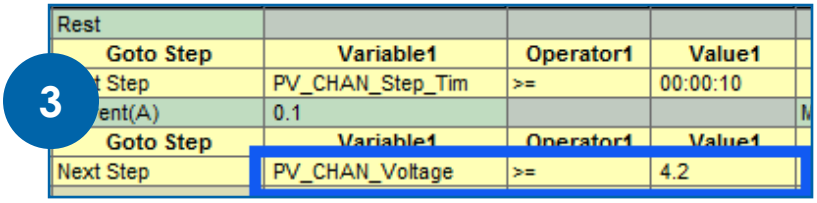

- Cycle a battery until discharge capacity is 80% of nominal
- Parallel any number of channels together
- Over 90+ meta variables to select from in addition to numeric values
- User-defined variables using data from active test - New Feature
- Results stored in SQL database for robust storage solution
- Automatically export data into Excel or CSV format for easy reporting
- Plot data in real-time to see what is happening
- Interface control with 3rd part chambers and other hardware

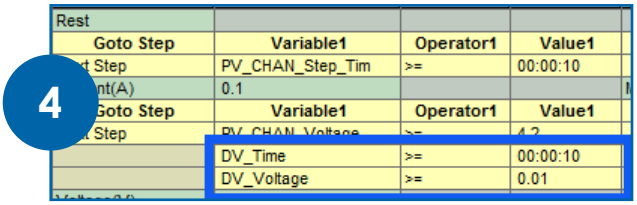
**"Arbin software gives the user complete control over the voltage / current charge-discharge functionality of the tester."**




1. Add steps and choose the control type from a drop-down list
2. Enter the control value or one of over 90+ meta variable
3. Add one or more termination conditions with the option to use logical AND & OR functions.
4. Set one or more data logging intervals to automatically capture extra data during important events

# Hardware Specifications

| Model Name | Channel Voltage Range | Channel Current Ranges (±) | Max Continuous Channel Power |
|---|---|---|---|
| **LBT22043 25V - 10A** | 0V to 25V | 10A / 1A / 100mA | 250W |
| **LBT22043 25V - 20A** | 0V to 25V | 20A / 2A / 100mA | 500W |
| **LBT22023 25V - 50A** | 0V to 25V | 50A / 5A / 100mA | 1250W |
| **LBT22013 25V - 100A** | 0V to 25V | 100A / 10A / 1A | 2500W |

| Specification | | LBT22043 25V - 10A | LBT22043 25V - 20A |
|---|---|---|---|
| Voltage | Measurement Resolution | < 0.8mV (16-bit) | < 0.8mV (16-bit) |
| | Precision | < 100ppm (0.01%) | < 100ppm (0.01%) |
| | Control Accuracy | < 0.02% | < 0.02% |
| | Input Impedance | 4M Ohm | 4M Ohm |
| Current | Noise Free Resolution | 16-bit | 16-bit |
| | Precision | < 100ppm | < 100ppm |
| | Control Accuracy (0.02% FSR) | 10A Range < 4mA<br>1A Range < 0.4mA<br>100mA Range < 0.04mA | 20A Range < 8mA<br>2A Range < 0.8mA<br>100mA Range < 0.04mA |
| | Rise Time | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <1ms<br>Time required for current output to get from 10-90% of setpoint value |
| Time | Minimum Step Time | 5mS | |
| | Data Logging Rate | 2000 points per second, per system | |
| | Measurement Precision | 100µS | |
| Bipolar Linear Circuit Type | | Allows cross-zero linearity and no switching time between charge & discharge | |
| Connection for PC | | TCP/IP (Ethernet) | |
| Ventilation Method | | Air cooled, *variable speed fans* | |

# Hardware Specifications

| Model Name | Channel Voltage Range | Channel Current Ranges (±) | Max Continuous Channel Power |
|---|---|---|---|
| **LBT22043 25V - 10A** | 0V to 25V | 10A / 1A / 100mA | 250W |
| **LBT22043 25V - 20A** | 0V to 25V | 20A / 2A / 100mA | 500W |
| **LBT22023 25V - 50A** | 0V to 25V | 50A / 5A / 100mA | 1250W |
| **LBT22013 25V - 100A** | 0V to 25V | 100A / 10A / 1A | 2500W |

| Specification | | LBT22023 25V - 50A | LBT22013 25V - 100A |
|---|---|---|---|
| Voltage | Measurement Resolution | < 0.8mV (16-bit) | < 0.8mV (16-bit) |
| | Precision | < 100ppm (0.01%) | < 100ppm (0.01%) |
| | Control Accuracy | < 0.02% | < 0.02% |
| | Input Impedance | 4M Ohm | 4M Ohm |
| Current | Noise Free Resolution | 16-bit | 16-bit |
| | Precision | < 100ppm | < 100ppm |
| | Control Accuracy (0.02% FSR) | 50A Range < 20mA<br>5A Range < 2mA<br>100mA Range < 0.04mA | 100A Range < 40mA<br>10A Range < 4mA<br>1A Range < 0.4mA |
| | Rise Time | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <1ms<br>Time required for current output to get from 10-90% of setpoint value |
| Time | Minimum Step Time | 5mS | |
| | Data Logging Rate | 2000 points per second, per system | |
| | Measurement Precision | 100µS | |
| Bipolar Linear Circuit Type | | Allows cross-zero linearity and no switching time between charge & discharge | |
| Connection for PC | | TCP/IP (Ethernet) | |
| Ventilation Method | | Air cooled, *variable speed fans* | |

# Hardware Specifications

| Model Name | Channel Voltage Range | Channel Current Ranges (±) | Max Continuous Channel Power |
|---|---|---|---|
| **LBT22023 40V - 20A** | 0V to 40V | 20A / 2A / 100mA | 800W |
| **LBT22013 40V - 75A** | 0V to 40V | 75A / 15A / 1A | 3kW |
| **LBT22013 40V - 150A** | 0V to 40V | 150A / 75A / 15A / 1A | 6kW |

| Specification | | LBT22023 40V - 20A | LBT22013 40V - 75A | LBT22013 40V - 150A |
|---|---|---|---|---|
| Voltage | Measurement Resolution | ~1mV (16-bit) | ~1mV (16-bit) | ~1mV (16-bit) |
| | Precision | < 100ppm (0.01%) | < 100ppm (0.01%) | < 100ppm (0.01%) |
| | Control Accuracy | < 0.02% | < 0.02% | < 0.02% |
| | Input Impedance | 4M Ohm | 4M Ohm | 4M Ohm |
| Current | Noise Free Resolution | 16-bit | 16-bit | 16-bit |
| | Precision | < 100ppm | < 100ppm | < 100ppm |
| | Control Accuracy (0.02% FSR) | 20A Range < 8mA<br>2A Range < 0.8mA<br>100mA Range < 0.04mA | 75A Range < 30mA<br>15A Range < 6mA<br>1A Range < 0.4mA | 150A Range < 60mA<br>75A Range < 30mA<br>15A Range < 6mA<br>1A Range < 0.4mA |
| | Rise Time | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <2ms<br>Time required for current output to get from 10-90% of setpoint value |
| Time | Minimum Step Time | 5mS | | |
| | Data Logging Rate | 2000 points per second, per system | | |
| | Measurement Precision | 100µS | | |
| Bipolar Linear Circuit Type | | | Allows cross-zero linearity and no switching time between charge & discharge | |
| Connection for PC | | | TCP/IP (Ethernet) | |
| Ventilation Method | | | Air cooled, *variable speed fans* | |

# Hardware Specifications

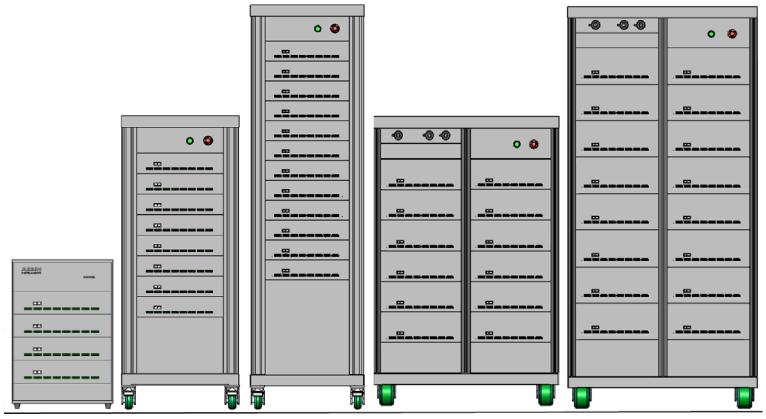
| Model Name | Channel Voltage Range | Channel Current Ranges (±) | Max Continuous Channel Power |
|---|---|---|---|
| **LBT22023 60V - 15A** | 0V to 60V | 15A / 2A / 100mA | 900W |
| **LBT22013 60V - 50A** | 0V to 60V | 50A / 10A / 1A | 3kW |
| **LBT22013 60V - 100A** | 0V to 60V | 100A / 50A / 10A / 1A | 6kW |

| Specification | | LBT22023 60V - 15A | LBT22013 60V - 50A | LBT22013 60V - 100A |
|---|---|---|---|---|
| Voltage | Measurement Resolution | < 2mV (16-bit) | < 2mV (16-bit) | < 2mV (16-bit) |
| | Precision | < 100ppm (0.01%) | < 100ppm (0.01%) | < 100ppm (0.01%) |
| | Control Accuracy | < 0.02% | < 0.02% | < 0.02% |
| | Input Impedance | 4M Ohm | 4M Ohm | 4M Ohm |
| Current | Noise Free Resolution | 16-bit | 16-bit | 16-bit |
| | Precision | < 100ppm | < 100ppm | < 100ppm |
| | Control Accuracy (0.02% FSR) | 15A Range < 6mA<br>2A Range < 0.8mA<br>100mA Range < 0.04mA | 50A Range < 20mA<br>10A Range < 4mA<br>1A Range < 0.4mA | 100A Range < 40mA<br>50A Range < 20mA<br>10A Range < 4mA<br>1A Range < 0.4mA |
| | Rise Time | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <1ms<br>Time required for current output to get from 10-90% of setpoint value | <2ms<br>Time required for current output to get from 10-90% of setpoint value |
| Time | Minimum Step Time | 5mS | | |
| | Data Logging Rate | 2000 points per second, per system | | |
| | Measurement Precision | 100µS | | |
| Bipolar Linear Circuit Type | | | Allows cross-zero linearity and no switching time between charge & discharge | |
| Connection for PC | | | TCP/IP (Ethernet) | |
| Ventilation Method | | | Air cooled, *variable speed fans* | |

## Chassis Sizes

Multiple chassis sizes are available ranging from small benchtop units up to large wheeled chassis.

| Dimensions (W x D x H) |
|---|
| 15.4" x 20" x 23" |
| 20" x 34" x 51" |
| 20" x 34" x 72" |
| 34" x 33" x 51" |
| 34" x 33" x 72" |



## Training & Support


Arbin's knowledgeable customer service team is well-known throughout the industry for their responsiveness and dedication. Application engineers are always available by phone or email, and with equipment running in over 50 countries, Arbin has experienced support technicians nearby to help install equipment, answer questions, and provide any maintenance that may be necessary over the life of your system. Additionally, our expansive library of video tutorials make it easy for novice users to learn or experienced users to refresh their knowledge at any time.


**2 Year Standard Warranty**

**Arbin Headquarters**

- College Station, Texas USA

**Worldwide Locations**

- Canada
- China
- Germany
- Hong Kong
- Korea
- Taiwan

**Representatives**

- Australia
- Brazil
- France
- India
- Israel
- Italy
- Japan
- Singapore
- Spain
- Thailand
- Turkey
- UAE
- United Kingdom

**"With Arbin, you can see minute changes in the battery and this gives researchers better predictability of when the end of life will occur in a reduced amount of time."**

— J. Novak, Sandia

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