MSTAT

ARBIN INSTRUMENTS

High Precision Multichannel Potentiostat/Galvanostat

Voltage Range
-5 to 5V
Current Range
5A/500mA/20mA/1mA
Channel #
4 to 64

Product Description

Arbin's **MSTAT** system is designed for high performance electrochemical research of battery materials and advanced battery cell testing. Each channel is an **independent potentiostat/galvanostat** and gives users full control of test profiles and data logging to offer **unmatched flexibility**.

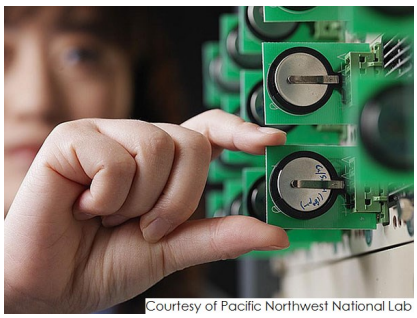
The Arbin **MSTAT** provides **true bipolar circuitry** to ensure cross-zero linearity with no switching time between charge and discharge. MSTAT hardware provides both **digital and analog voltage control.** Digital control maximizes the safety of battery cycling and can handle dynamic device resistance, while analog control enables the fast response and stability necessary for electrochemical applications.

Product Highlights

- Each channel provides four current ranges with industry-leading **24-bit resolution**. (1µV for Voltage)
- **Multiplexed EIS** (up to 2MHz) where a single module can be customized to share between 4 to 32 channels offering unmatched value.
- **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.
- Additional **reference electrode built-in** for each channel *in addition to* the standard 4-point Kelvin connection.
- **Comprehensive safety features** for lithium-ion battery testing.

Primary Applications

- Battery Life Cycle Testing and Materials Research
- dQ/dV & Coulombic Efficiency (HPC)
- Symmetric-Cell Testing
- PITT/GITT
- Cyclic & Linear Sweep Voltammetry
- Chrono-amperometry/potentiometry
- Multi-Electrode Experiments



Courtesy of Pacific Northwest National Lab

"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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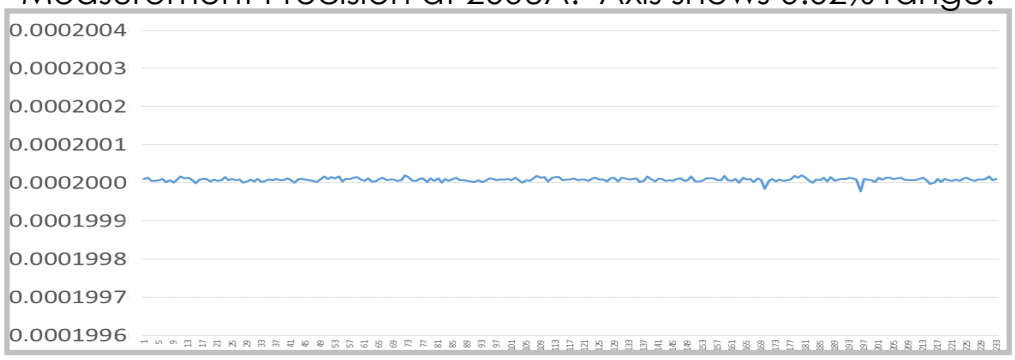
Experts in Test Instrumentation

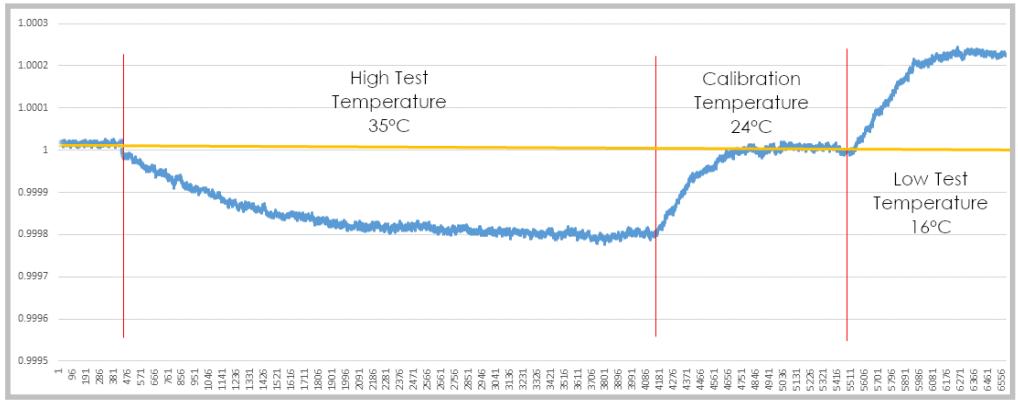
We learned a lot about measurement precision during our **3-year ARPA-E project** with **Ford Motors** and **Sandia National Lab**. We use premium reference meters and shunts representing the global standard for metrology. Arbin has all the tools necessary to develop testing circuits beyond the old industry 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.

"The measurement precision of Arbin testers allow them to generate high confidence data you can rely on."

Measurement Precision at 200uA! Axis shows 0.02% range.



Effect of Temperature on Accuracy (~0.000185% / 1°C)



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 Lab, 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

Hardware Specifications

Model Name	Channel Voltage Range	Channel Current Ranges (±)	Max Continuous Channel Power
MSTAT ±5V 5A	-5V to 5V	5A / 500mA / 20mA / 1mA	25W

Technical Specification		MSTAT ±5V 5A
Voltage	Measurement Resolution	<1µV (24-bit)
	Measurement Precision	< 60ppm (0.006%)
	Control Accuracy	< 0.01%
	Input Impedance	100G Ohm
Current	Noise Free Resolution	0.0003% (18-bit)
	Control Accuracy (0.01% FSR)	5A Range < 1mA 500mA Range < 0.1mA 20mA Range < 4µA 1mA Range < 0.2µA
	Rise Time	<100µs 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 Resolution	100µs
Bipolar Linear Circuit Type		Allows cross-zero linearity and no switching time between charge/discharge
Connection for Computer & Networking		TCP/IP (Ethernet)
Ventilation Method		Air cooled; *variable speed fans*
Environmental Operating Temperature		*16 to 35°C*
Computer Specifications		Dell PC with i7 CPU, 22" flat-screen monitor is included, pre-loaded with our MITS Pro testing software and SQL
Auxiliary Voltage Input		1 auxiliary voltage input per channel
EIS Integration (Optional)		Up to 32 channels may share a single EIS module

Available Auxiliary Options

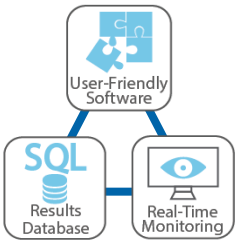
Select from the options below to expand the capability of your MSTAT system.

EIS Module		An EIS module can be shared across 4 to 32 channels. **G-1010E** (*Recommended): 1A max, 10µHz to 2MHz **Arbin EIS 20P**: 1A max, 0.01Hz to 10kHz **Arbin EIS 40P**: 0.5A max, 0.01Hz to 10kHz
Additional Reference Electrodes		The standard channel connection is a 4-point Kelvin connection (I+, I-, V+, V-). An additional reference electrode (V+, V-) is also included with each channel. This options adds *more* reference electrodes in cases where a high number are needed.
Temperature Measurement		Thermocouple or Thermistor inputs used to record temperature as well as be used control the test schedule.
Arbin Temperature Chamber		Arbin temperature chamber equipped with RTD for each cell holder to provide precise temperature measurement and stable temperature from 10 to 60 degree Celsius. Cell isolation provides a safer testing environment that if cells are in a shared space.
3rd Party Chamber Interface		Interface with a 3rd party temperature chamber so Arbin software can turn chamber on/off and adjust temperature.
Auto-Calibration		Channels may be calibrated automatically when connected to a digital multimeter (sold separately).
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.

Safety Features

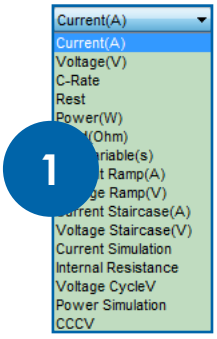
- Multiple levels of internal fusing and over-temperature control measures
- Each system has a fully redundant microcontroller dedicated to monitoring internal communication, voltage and current safety limits
- Testing schedules can have layers of global and step-driven safety limits for voltage, current and power
- Logic-driven scheduling interface allows for additional safety layers based on inputs such temperature, current, or voltage measurements

Software Suite

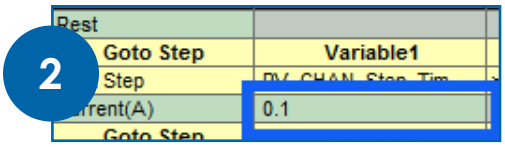


- Perform [optional] EIS every [custom] number of cycles
- Cycle a battery until discharge capacity is 80% of nominal
- Parallel any number of channels together
- Over 90+ meta variables to select from in addition to numeric values
- Results stored in SQL database for robust storage solution
- Automatically export data into Excel format for easy reporting
- Plot data in real-time to see what is happening

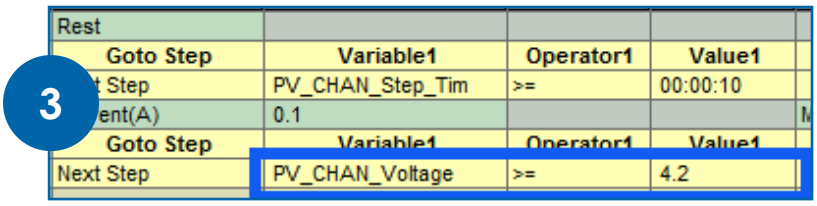
"Arbin software gives the user full control over the potentiostatic / galvanostatic functionality of the tester."



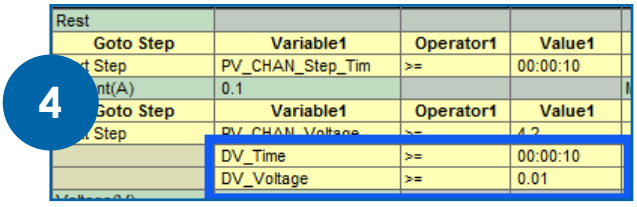
1. Add steps and choose the control type from a drop-down list



2. Enter the control value or one of over 90+ meta variable



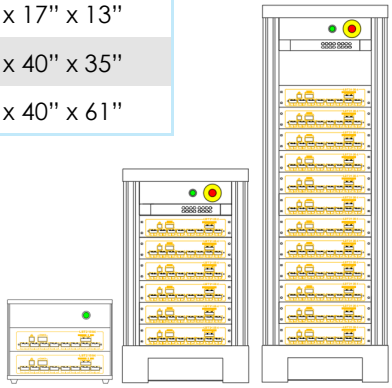
3. Add one or more termination conditions with the option to use logical AND & OR functions.



4. Set one or more data logging intervals to automatically capture extra data during important events

Chassis Sizes

Dimensions (W x D x H)
16" x 17" x 13"
21" x 40" x 35"
21" x 40" x 61"



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

"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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