



## BT-I

# Battery Testing & Research Solutions

A multiple independent channel test station fine-tuned for testing batteries, supercapacitors, and other energy storage devices. The BT-I Series provides individual voltage clamp safety limits for testing to prevent damage to the devices being tested. Includes a PC preloaded with our MITS Pro and Data Watcher software for writing test schedules, monitoring real-time data, and reviewing and plotting test results.

MODEL	VOLTAGE	CURRENT
BT-I-100	(-2)V to 10V	± 10A/100mA/1mA
BT-I-200	0V to 20V	± 10A/100mA/1mA

### Primary Applications:

- Lithium, Lead-acid, Nickel & Alkaline Battery Testing
- Small battery packs
- Half cell testing and materials research
- Primary & secondary battery testing

- Multiple independent channels, where each channel functions independently to run multiple experiments simultaneously.
- Each channel comes with three current ranges with 16 bit resolution.
- Advanced software package, MITS Pro (Multiple Integrated Testing System, professional version), provides flexible scheduling, user-friendly interface, distributed system control and data acquisition
- Software provides easy data analysis and plotting based in Data Watcher or Microsoft Excel
- In multi-electrode applications, each channel accommodates an individual RE, or several channels can share one RE (such as in a combinatorial cell). This results in accurate control and measurement and enables individual IR drop compensation. Channels share ground as the counter electrode (CE).

## Key Features

## Individual Voltage Clamp

- Each channel in the test station will be safely controlled by their own Voltage Clamp Value
- User-defined value set in the software that is applied at the hardware level. The system will not allow the voltage to go above or below the set clamp values on all channels to keep batteries within the safety settings.
- The system provides a Low Voltage Clamp Value and High Voltage Clamp Value



## BT-I

**Model Number: BT-I-100**  
**BT-I-200**

### Hardware Specifications

MODEL NUMBER	BT-I-100	BT-I-200
Bipolar Linear Circuit Type	Provides zero switching time between charge and discharge Circuit Board: 2243-4	
Voltage Range (max/min)	-2V to 10V	0V to 20V
Accuracy of Voltage Control & Reading	±10mV, 0.05% Full Scale Resolution	
Current Ranges Provided	High: 10A ± 10mA	High: 10A ± 10mA
0.05% Full Scale Resolution	Medium: 100mA ± 100uA	Medium: 100mA ± 100uA
	Low: 1mA ± 1uA	Low: 1mA ± 1uA
Minimum V at Maximum Current	-2V @ 10A	0V @ 20A
Maximum Continuous Power Output/Channel	100W	200W
Voltage Measurements Input Impedance	~10GΩ	
Current Rise Time	100-150μS Time required for current output to get from 10%-90% of requested value	
Current and Voltage Resolution	16 Bit or 0.0015% FSR	
Voltage Clamp	Individual Voltage Clamp	
Connection for Batteries	Standard 6 ft. cables with alligator clips Arbin can also provide different battery holder options to allow easy engagement of the device to the test station	
Connection to Computer	TCP/IP	
Ventilation Method	Air cooled, front-to-rear airflow	
Room Operating Temperature	10 to 35 degrees C	
Computer Specifications	PC with 22" flat-screen monitor is included, preloaded with our MITS Pro testing software	

CHASSIS SIZE OPTIONS	CHANNEL NUMBER OPTIONS	
15" X 30" X 25"	4	4
30" X 30" X 45"	32	32
30" X 30" X 77"	64	64

Arbin can provide input power options of 110V or 220V Single Phase, or 208V, 380V or 480V Three Phase System power input options are determined by customer site and system power required.



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**BT-I-200**

### Software Control Specifications

Current (A)	Outputs constant current to the cell or battery at the value specified Positive current refers to charge and negative current refers to discharge
Voltage (V)	Outputs constant voltage to the cell or battery at the value specified
C-Rate	C-Rate is a method for indicating the discharge as well as the charge current of a battery. It can be expressed as $I=M*C$ where I=current A; C=battery capacity; M is the C-rate value.
Rest	The battery is disconnected from the charge/discharge circuit but remains connected to the voltage measurement circuit to enable open-circuit voltage measurement
Power (W)	Outputs constant power to the cell of battery at the value specified. This is accomplished by iteratively measuring the battery voltage and calculating the current necessary according to Ohm's law in order to achieve the power level set by the user. Each time the channel is sampled, the calculation is preformed allowing the current to quickly stabilize at the desired power level and maintain this power level as the voltage changes.
Load (Ohm)	Applies a constant resistance load to the battery at the value specified. A positive value for load will result in a positive current and a negative value for load will result in a negative current
Set Variable(s)	Change test related variables including channel capacity, energy, and all test counter variables
Current Ramp	Generates a current ramp with a positive scan rate for increasing current and a negative scan rate to generate decreasing current ramp
Current Staircase	Generates a current staircase with increasing current and negative decreasing current staircase with adjustable step amplitude
Current and Voltage Simulation	Non-standard time-domain functions may be inputted from external sources such as ASCII data streams and used as control parameters for repetitive tests
DC Internal Resistance	This function applies a 10-pulse train with 1ms pulse width of the specified magnitude following a constant-current charge or discharge step
Current CV	Mode to create linear sweeps in one step, eliminating the need to jump steps or reverse sweep directions
CC-CP	Combine constant current control and constant voltage control into one stage "CC-CP"
End Conditions	Time, Voltage, Current, Capacity, Energy, $\Delta V$ , $DV/dt$ , formula, meta-variables, and other combinations
Data Logging Rate	During a standard step: 40-150 data points per second, per PC
Network Capabilities	Provide TCP/IP access for networking
Data Result File	Imported into Microsoft Excel; Arbin's Excel Data Pro macro included for easy data manipulation
Data File Content	Channel data; test time, step time, voltage, current, capacity, energy, first/second derivative of I or V, auxiliary input data (optional). Statistical data: cycle #, cycle capacity/energy, max voltage, etc.

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### Auxiliary Options & Accessories

Arbin Instruments provides a wide variety of auxiliary modules for expanding the capability of the main I, V control circuitry. Each module plugs securely to the bus board. These auxiliary modules are classified as input, input/output, and control modules.

**Input Modules:** Auxiliary inputs can be used to record desired data as well as to terminate or regulate charge and discharge processes based upon measured conditions. Selectable inputs are of V (voltage),

**Input / Output Modules:** Digital I/O is an integrated peripheral on/off control. The output commonly is used to control valves and switches. The input allows an external control signal to control testing procedure.

**Control Modules:** Arbin provides control modules for Auto-Calibration, Smart Battery Testing, External Charger, Temperature Chamber Interface and AC Impedance Measurement.

For more information please visit: [www.arbin.com/products/accessories/auxiliaries.htm](http://www.arbin.com/products/accessories/auxiliaries.htm)

Several safety provisions are provided in every Arbin system. There are three levels of fusing provided inside the system for further protection at the channel, board, and power supply levels. The software also has several safety functions with which the user can avoid over charging the cells, over discharging, overheating, etc.

### Safety & UPS Features

**Smart UPS:** This option uses a very small Smart UPS to back up power to the computer only. This allows the user to enable auto resume options to all of specific channels after a stop due to power interruption. Provision is provided for the user to intervene if they so desire before the channels resume. This is an essential component for any user with an unreliable power source unless you have the whole facility on backup power.

