Electric Vehicle Testing Solutions

With over 20 years of experience in designing and manufacturing test systems for energy storage devices, Arbin offers complete regenerative testing solutions for high power battery packs

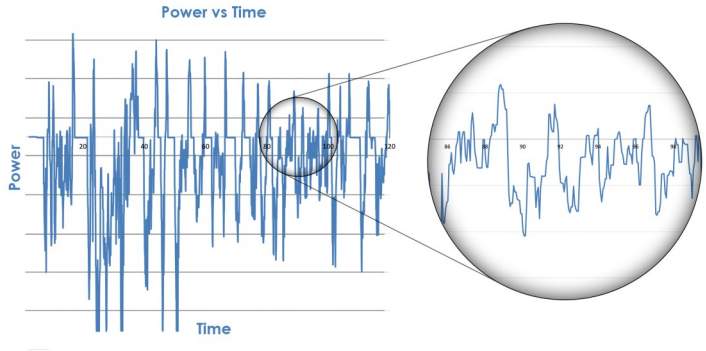
Arbin's EVTS series is designed for testing high power battery packs and modules. Today's applications like electric vehicles and military technologies demand high-reliability and safe testing environments, so the dependability, accuracy, and safety of these systems are core standards. The regenerative power circuitry within the system allows power to be sent back to the grid, providing a more economical testing solution. A full range of customizable options allow users to create a complete testing package that ideally suits their needs.

Key Features

- Designed for Battery Pack and Modules up to 800V or 250kW
- Smart Communication Protocols (CAN-Bus / SMBus)
- High Speed Drive Cycle Simulation Control
- Temperature Chamber Integration
- Real-Time Test Monitoring and On-the-Fly Modifications

Advanced Simulation Capabilities

EVTS is capable of advanced charge and discharge regimes using a library of unique control types. One of the most popular features of the EVTS is the simulation control type which allows the system to charge or discharge the pack in the lab using a dynamic drive profile. Simulation control allows users to easily program advanced test profiles such as Federal Urban Drive Schedule (FUDS) or Dynamic Stress Tests (DST) without writing complex test protocols/schedules.



Arbin's proprietary MITS Pro Software empowers users to write flexible test schedules based on current, voltage, power and a library of additional software based control types.

EVTS

Product Description

- Arbin's latest regenerative power board circuit design allows for testing of batteries, packs, and modules up to 600V and 250kW in a single chassis.
- With a 10mS rise time, Arbin's EVTS allows for precise testing while simulating real-life drive cycles on your battery pack.
- With a dedicated microcontroller per channel, the test station can handle 100mS per point during simulation control with data logging as fast as 100mS to precisely record how the device is reacting to the test protocol.
- Regenerative Power Efficiency: >=90%
- Multiple Current Ranges and Dual Voltage Ranges can be provided for greater flexibility and accuracy when testing low and high power battery packs with a single test station
- 0.1% Full Scale Accuracy and 16 Bit Resolution for accurate and detailed result analysis
- Uninterruptible Power Supply provided within the test station for a controlled start-up and shut-down sequence during normal operation. This UPS ensures that no damage will be incurred to the machine in case of power outages.
- Arbin can provide an optional auxiliary chassis to house separate auxiliary channels. This provides additional data collection and safety monitoring for Secondary Voltage Measurements, Temperature Measurements, and Digital Input/ Output, and Temperature Chamber Control.

Expanded Modes of Operation

Arbin's EVTS series has been redesigned to provide even more flexibility and a wider range of operating specifications. Every Arbin system features fully independent test channels which are each capable of multiple current ranges. In addition, most Arbin systems allow channel paralleling which enables users to increase the current handling capabilities of their system.

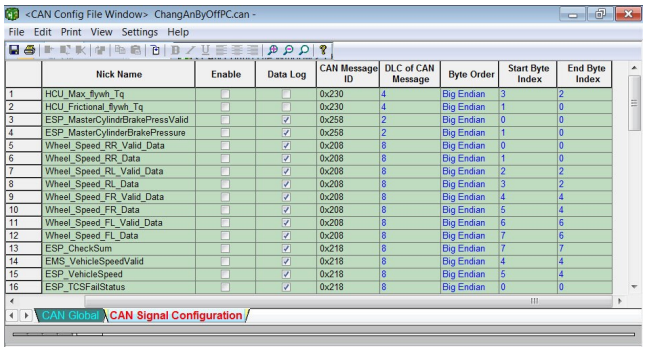
However, certain new EV test systems ranging from 200V to 400V are available with optional Expanded Modes of Operation (XMO). These powerful new modes of operation allow for expanded testing capabilities. With Expanded Modes of Operation, the Arbin EVTS-X is capable of handling testing scenarios that range from -400 to 800 Volts with one system.

For more information about Arbin's EVTS-X line or our Expanded Modes of Operation, please contact your Arbin representative.

EVTS

Optional Features

- Arbin offers CAN-Bus Communication for our EVTS systems that can be used to test battery packs with integrated Battery Management Systems (BMS). The Arbin CAN-Bus device supports reading, writing, and sending CAN messages, logging, monitoring, setting, controlling, and protecting the battery pack. For example, if over-voltage occurs the BMS protects the battery from operating outside of safe limits. The CAN-Bus communicates this valuable information to Arbin's MITS Pro software and the EVTS tester before causing damage to the battery. Arbin follows the standard CAN-Bus specification such as SAE J1939 protocol, CANopen or even user-defined protocols, With Arbin's CAN-Bus, there is no third party equipment, 3rd party DLL package or 3rd party licenses' needed to operate.



	Nick Name	Enable	Data Log	CAN Message ID	DLC of CAN Message	Byte Order	Start Byte Index	End Byte Index
1	HCU_Max_flywh_Tq			0x230	4	Big Endian	3	2
2	HCU_Frictional_flywh_Tq			0x230	4	Big Endian	1	0
3	ESP_MasterCylindrBrakePressValid		✓	0x258	2	Big Endian	0	0
4	ESP_MasterCylinderBrakePressure		✓	0x258	2	Big Endian	1	0
5	Wheel_Speed_RR_Valid_Data		✓	0x208	8	Big Endian	0	0
6	Wheel_Speed_RR_Data		✓	0x208	8	Big Endian	1	0
7	Wheel_Speed_RL_Valid_Data		✓	0x208	8	Big Endian	2	2
8	Wheel_Speed_RL_Data		✓	0x208	8	Big Endian	3	2
9	Wheel_Speed_FR_Valid_Data		✓	0x208	8	Big Endian	4	4
10	Wheel_Speed_FR_Data		✓	0x208	8	Big Endian	5	4
11	Wheel_Speed_FL_Valid_Data		✓	0x208	8	Big Endian	6	6
12	Wheel_Speed_FL_Data		✓	0x208	8	Big Endian	7	6
13	ESP_CheckSum		✓	0x218	8	Big Endian	7	7
14	EMS_VehicleSpeedValid		✓	0x218	8	Big Endian	4	4
15	ESP_VehicleSpeed		✓	0x218	8	Big Endian	5	4
16	ESP_TCSFailStatus		✓	0x218	8	Big Endian	0	0

MITS Pro allows users to create custom CAN definitions, monitor CAN data in real-time, and export data for analysis through Arbin's Data Watcher software

- Digital input/output relay option is commonly used for triggering external conditions such as turning on or off an external charger or providing a trigger for a chamber door or other third party hardware. Available in TTL and Relay.
- Analog input/output module option is designed to measure and control third party devices that use a 0-10V control signal. The Analog I/O board offers control with closed loop (PID) or open loop communication depending on the application.
- Optional auxiliary voltage measurement channels are available to measure cell voltage in a multi-cell battery pack or to measure the reference electrode voltage in a multi-electrode setup. The value of voltage can be recorded in the results file or used to further control the experiment.
- Optional auxiliary temperature measurement channels can measure the temperature at any point in the setup using either a thermocouple module (type E, J, K, or T) or a thermistor module. The value of temperature can be recorded in the results file and/or used to further control the experiment.
- Arbin's temperature chamber interface option (MTCI) allows the system to communicate with a third-party temperature chamber controller during testing. The MTCI module tells the chamber controller what temperature set-point to use during each test step, allowing the user to program automatic temperature profiles in their tests.

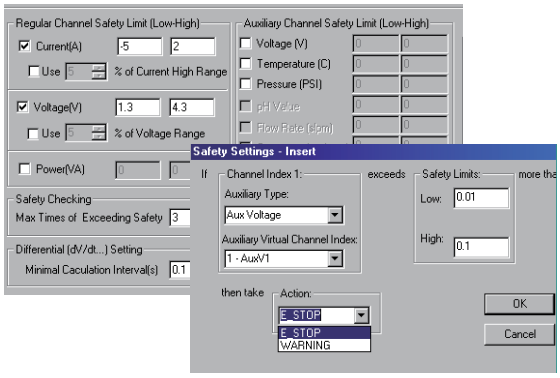
Available auxiliary chassis allows connectivity for auxiliary temperature and voltage measurements as well as analog input/output modules for interaction and control of third party devices.

EVTS

Safety Features

All Arbin test stations are designed and manufactured based on industry regulations and arrive CE certified. The Arbin system includes an array of safety features that protect the user, the devices under test, and the test station.

- The system itself is secure internally to protect from unintentional misuse. The system is equipped with an emergency stop button and multiple levels of fusing are provided inside the system for protections at the channel/board and power supply level. Arbin's Watchdog circuit monitors the machine's internal communication between the PC and onboard microcontrollers and will stop all tests if there is a failure that poses a risk. An optional light tower array can be used to visually alert the user to potential problems and the PC can be programmed to sound an audible alarm.



- The user is able to implement safety limits in the software for current, voltage, total power, as well as temperature or other auxiliary readings. These values can be programmed to send the system into a rest state for a period of time, or simply stop the test and disconnect the charge/discharge circuitry. There are separate limits available for each test schedule as a whole, and individual steps within the test schedule.

- The reliability of testing can be increased even further by adding a smart UPS to the controlling PC. This will allow tests to automatically resume after a brief power failure if they are in a safe condition and permits user intervention in the process. There is provision for the user to intervene if desired before the channels resume. This is an essential component for any user with an unreliable power source unless the entire facility is on backup power.

EVTS

Hardware Specifications

MODEL	200V-100A	200V-200A	200V-300A	200V-600A
Voltage Range Provided	20V to 200V			
0.1% Full Scale Accuracy	± 400mV			
Voltage and Current Resolution	16 bit			
Current Ranges Provided 0.1% Full Scale Accuracy	High: 100A ± 200mA Low: 10A ± 20mA	High: 200A ± 400mA Low: 10A ± 40mA	High: 300A ± 600mA Low: 10A ± 40mA	High: 600A ± 1.2A Med: 100A ± 200mA Low: 10A ± 20mA
Minimum V at Maximum Current	20V @ 100A	20V @ 200A	20V @ 300A	20V @ 600A
Total System Power	120kW	120kW	120kW	120kW
Number of Test Channels	6	3	2	1
Chassis Size (W x D x H)	47" X 37" X 77"	47" X 37" X 77"	47" X 37" X 77"	47" X 37" X 77"

MODEL	300V-100A	300V-200A	300V-200A
Voltage Range Provided	25V to 300V		
0.1% Full Scale Accuracy	± 600mV		
Voltage and Current Resolution	16 bit		
Current Ranges Provided 0.1% Full Scale Accuracy	High: 100A ± 200mA Low: 10A ± 20mA	High: 200A ± 400mA Low: 10A ± 40mA	High: 200A ± 400mA Low: 10A ± 100mA
Minimum V at Maximum Current	25V @ 100A	25V @ 200A	25V @ 200A
Total System Power	120kW	240kW	120kW
Number of Test Channels	4	4	2
Chassis Size (W x D x H)	47" X 37" X 77"	47" X 37" X 37"	31" X 37" X 77"

EVTS

Hardware Specifications

MODEL	300V-400A	300V-400A	300V-800A
Voltage Range Provided	25V to 300V		
0.1% Full Scale Accuracy	± 600mV		
Voltage and Current Resolution	16 bit		
Current Ranges Provided 0.1% Full Scale Accuracy	High: 400A ± 800mA Med: 100A ± 200mA Low: 10A ± 20mA	High: 400A ± 800mA Med: 100A ± 200mA Low: 10A ± 20mA	High: 800A ± 1.6A Med: 100A ± 200mA Low: 10A ± 20mA
Minimum V at Maximum Current	25V @ 400A	25V @ 400A	25V @ 800A
Total System Power	120kW	240kW	240kW
Number of Test Channels	1	2	1
Chassis Size (W x D x H)	31" X 37" X 77"	47" X 37" X 37"	47" X 37" X 37"

MODEL	400V-300A	400V-300A	400V-600A
Voltage Range Provided	30V to 400V		
0.1% Full Scale Accuracy	± 800mV		
Voltage and Current Resolution	16 bit		
Current Ranges Provided 0.1% Full Scale Accuracy	High: 300A ± 600mA Med: 50A ± 100mA Low: 10A ± 20mA	High: 300A ± 600mA Med: 50A ± 100mA Low: 10A ± 20mA	High: 600A ± 1.2A Med: 100A ± 200mA Low: 10A ± 20mA
Minimum V at Maximum Current	30V @ 300A	30V @ 300A	30V @ 600A
Total System Power	120kW	240kW	240kW
Number of Test Channels	1	2	1
Chassis Size (W x D x H)	31" X 37" X 77"	47" X 37" X 37"	47" X 37" X 37"

EVTS

Hardware Specifications

MODEL	500V-250A	500V-250A	500V-500A
Voltage Range Provided	35V to 500V		
0.1% Full Scale Accuracy	± 1.0V		
Voltage and Current Resolution	16 bit		
Current Ranges Provided 0.1% Full Scale Accuracy	High: 250A ± 500mA Med: 50A ± 100mA Low: 10A ± 20mA	High: 250A ± 500mA Med: 50A ± 100mA Low: 10A ± 20mA	High: 500A ± 1.0A Med: 100A ± 200mA Low: 10A ± 20mA
Minimum V at Maximum Current	35V @ 250A	35V @ 250A	35V @ 500A
Total System Power	125kW	250kW	250kW
Number of Test Channels	1	2	1
Chassis Size (W x D x H)	31" X 37" X 77"	47" X 37" X 37"	47" X 37" X 37"

MODEL	600V-150A	600V-300A
Voltage Range Provided	40V to 600V	
0.1% Full Scale Accuracy	± 1.20V	
Voltage and Current Resolution	16 bit	
Current Ranges Provided 0.1% Full Scale Accuracy	High: 150A ± 300mA Low: 10A ± 20mA	High: 300A ± 600mA Med: 50A ± 100mA Low: 10A ± 20mA
Minimum V at Maximum Current	40V @ 150A	40V @ 300A
Total System Power	180kW	180kW
Number of Test Channels	2	1
Chassis Size (W x D x H)	47" X 37" X 37"	47" X 37" X 37"

700 and 800 Volt custom systems are available upon request.

Please contact Arbin for more information about a custom designed system to meet your testing specifications.

EVTS

Shared Hardware Specifications

SERIES	EVTS200/300/400/500/600
Voltage Input Impedance	~5MΩ
Current Rise Time	~10mS
Voltage Clamp	Individual / Channel Based Voltage Clamp
Internal Board Circuitry	Regenerative circuitry, PWM
Ventilation Method	Air cooled
Room Operating Temperature	10 to 35 degrees C
Relative Humidity	10-90% Non-Condensing
Connection to Computer	TCP/IP
Computer Specifications	PC with 22" flat-screen monitor is included, preloaded with our MITS Pro testing software

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 repairs 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.

EVTS

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.
Load (Ohm)	Applies a constant resistance load to the battery at the value specified. The load control type will always produce 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 negative scan rate generates decreasing current ramp.
Current Staircase	Generates a current staircase with increasing current, and negative decreasing current staircase with adjustable step amplitude.
Current and Power 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
CCCV	Allows users to implement a constant current-constant voltage charge regime in one step. Users specify the charge rate (CC) and the voltage limit (CV); with a specified current or time limit termination value.
Formula	Equips the user to control and limit schedule steps according to dynamic mathematical equations in addition to constants or instantaneous channel data
End Conditions	Time, Voltage, Current, Capacity, Energy, ΔV, 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.