



Smart Battery Testing Solutions

The Arbin BT-Smart series is a smart battery testing system which contains main I/V channels to charge/discharge a smart battery pack, an SMB input board to interact with the pack's SMBus, and auxiliary temperature channels. Main I/V and SMB inputs are integrated into a single connector eliminating the tangle of wires required for connecting to smart batteries.

Arbin's Smart Battery Testing Systems allows users to log data from their smart battery and compare it to the external data provided by the Arbin Testing System. Testing procedures can be influenced by the data that the Arbin Testing System acquires, or by the SMBus register values.

Arbin's testing software is also capable of manipulating SMBus registers during testing. All data specified in the SMBus 2.0 or 1.1 data specifications are stored in a database during testing and can be imported into Excel format for easy data manipulation.

BT-SMART

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|---------------|------------------|
| MODEL | BT-SMART 25V-10A |
| VOLTAGE | 2V to 25V |
| CURRENT | 10A/5A |
| # of CHANNELS | 24 |



- Independent Programmable control of current, voltage, load and power; providing constant, linear ramp, staircase and other control profiles generated by a specified formula
- High accuracy of 0.05% FSR control and reading of current and voltage on linear circuitry
- Fast current rise time of 100us with linear circuitry
- Single, fully integrated connector for smart batteries
- Synchronized data acquisition through Ethernet TCP/IP communication for SMB board to synchronize data acquisition with the main I/V channels
- Independent voltage clamp is a powerful hardware control to prevent voltage overshoot, which is particularly critical for Li-batteries. It allows the independent control of voltage clamp for each channel.
- Sliding racks designed for customers to accommodate 12 ~24 packs for convenient mounting/dismounting of the packs. Very Customized design to fit desired requirement

Key Features



BT-SMART

Smart Battery Features

- Our MITS Pro Software for Smart Battery integrates the capability to view/read, write, control or program information from the Smart Battery Register. The software provides advanced test scheduling options by allowing SMBus registers to be used as limit control and offers many programmable features.
- Smart Battery Channel View GUI is a uniquely designed window that allows users to display or access both main I/V channel parameters and SMBus registered data. The software provides advanced test scheduling options by allowing SMBus registers to be used as limit control and offers many programmable features.
- Limited control of SMBus register functions displayed as meta-variables that can be used to end or re-direct testing sequences. Smart Battery values may be selected as control limits within test protocols, much in the same way as using parameters from the I/V channel.
- This system is tested with most of the commonly employed gas gauge ICs, such as Texas Instruments, BQ 2000 series: BQ2060, BQ2083, BQ2040, and Power Smart, PS401, etc.

Software Specifications

| MODEL NUMBER | 25V-10A |
|---------------------------------------|---|
| Arbin Software | MITS Pro 4.0 |
| Standard Types of Control | Current and voltage control via constant, ramp, staircase, or user-defined formula Constant power, constant load |
| End Conditions | Time, Voltage, Current, Capacity, Energy, ΔV , DV/dt , Formula, Meta-Variables, and other combinations |
| Data Logging Rate | Current, voltage, or power simulation, response in seconds 40-150 data points per second, per PC |
| Simulation for Non-Formulated Profile | Current, voltage, or power simulation, response in seconds |
| Network Capabilities | TCP/IP access for networking provided |
| Data Result File | Imported into Microsoft Excel; Arbin's Excel Data Pro macro included for easy data manipulation |

BT-SMART

Hardware Specifications

| MODEL NUMBER | 25V-10A |
|--|---|
| Voltage Range (max/min) | 2V to 25V |
| Voltage Accuracy (0.05% FSR) | ±25mV |
| Voltage Resolution | 16 bit or 0.0015% |
| Current Ranges and Accuracy (0.05% FSR) | 10A ± 10mA 5A ± 5mA |
| Minimum V at Maximum Current | 2V @ 10A |
| Voltage Input Impedance | ~10Ω |
| Current Rise Time | 100μS |
| Current and Voltage Resolution | 14 Bit or 0.006% |
| Voltage Clamp | Individual channel-based Voltage Clamp |
| Number of Auxiliary Temperature Channels | 24 with Type K thermocouple sensors |
| Max Continuous Power per Channel | 250W |
| Internal Board Circuitry | Arbin 2243-2 bipolar board |
| Ventilation Method | Air cooled |
| Room Operating Temperature | 10 to 35 degrees C |
| Connection for Computer | TCP/IP |
| Computer Specifications | PC with 22" flat-screen monitor is included, preloaded with our MITS Pro testing software |
| Smart Battery Supported Chips (Texas Instruments, Renesas and Maxim) | TI BQ2060; TI two-chips: BQ20894 & BQ20Z70, TI one-chip: BQ20Z45, Renesas one-chip and two-chip, and Maxim one-chip.* |
| Number of Channels | 24 Channels |
| Chassis Size | 30" X 30" X 77" |

* If your chip(s) is not listed, please consult with your Arbin Sales Engineer.



BT-SMART

Auxiliary Options & Accessories

Arbin Instruments provides a wide variety of auxiliary modules for expanding the capability of the main I, V control circuitry.

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| Optional Auxiliary Voltage: | Can be used to measure and verify the cell voltage; These auxiliary channels can be assigned flexibly to the main I/V channels, including one-to-one map or one-to-many map. |
| Optional Auxiliary Temperature: | Can be used to measure and verify the cell temperature; These auxiliary channels can be assigned flexibly to the main I/V channels, including one-to-one map or one-to-many map. |
| Optional Thermal Chamber | Allows user to program different temperatures testing condition with thermal chamber to simulate environment testing conditions. |
| Controller Interface: | |
| Optional External Charger in Main I/V Channel: | <u>Built-in constant voltage external charger</u> - Some SMB packs require an external charger with a constant DC voltage supply. This option provides this capability without an additional power supply. |

External Charging connection - A selected external charging connection allows SMB battery charged by any external charger. During external charging, Arbin tester functions as a recorder to log in the testing data, voltage, current, etc. Either built-in charger or externally connected charger is integrated in MITS Pro Software and programmable.

Automatic on/off of charger - The charge/discharge power will be physically disconnected while discharging/charging respectively to guarantees no interference.

| | |
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| Optional High Speed Pulse Capability: | Allows users to run a sub-second single or repeated pulse profile. This option provides the capability to run GSM, CDMA, TDMA or other custom designed pulses. |
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For more information please visit: www.arbin.com/products/accessories/auxiliaries.htm

Safety & UPS Features

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.

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| Smart UPS: | This option uses a very small Smart UPS to back up power to the computer only. It allows users to enable the auto-resume option to all or specific channels whenever tests have stopped due to power interruption. Provision is made for the user to intervene if required before the channels resume after power failure. This option is almost a must for facilities with unreliable power sources, unless the entire facility is under backup power. |
|-------------------|---|

BT-SMART

Latest Register Functions in MITS – Smart Pro Software. Based on TI BQ 2060

| Variable | SMBus Comm Code | | SMBus Access | Units |
|-----------------------|-----------------|-------|----------------------------|-------------|
| | SMBus | HDQ16 | | |
| ManufacturerAccess | 0x00 | 0x00 | Read/write/control/program | n/a |
| RemainCapacityAlarm | 0x01 | 0x01 | Read/write/program | mAh, 10mWh |
| RemainTimeAlarm | 0x02 | 0x02 | Read/write/program | Minutes |
| BatteryMode | 0x03 | 0x03 | Read/write/program | n/a |
| AtRate | 0x04 | 0x04 | Read/write/program | mAh, 10mWh |
| AtRateTimeToFull | 0x05 | 0x05 | Read | minutes |
| AtRateTimeToEmpty | 0x06 | 0x06 | Read | minutes |
| AtRateOK | 0x07 | 0x07 | Read | Boolean |
| Temperature | 0x08 | 0x08 | Read/control | 0.1°K/0.1°C |
| Voltage | 0x09 | 0x09 | Read/control | mV |
| Current | 0x0a | 0x0a | Read/control | mA |
| AverageCurrent | 0x0b | 0x0b | Read | mA |
| MaxError | 0x0c | 0x0c | Read | percent |
| RelativeStateOfCharge | 0x0d | 0x0d | Read/control | percent |
| AbsoluteStateOfCharge | 0x0e | 0x0e | Read/control | percent |
| RemainCapacity | 0x0f | 0x0f | Read/control | mAh, 10mWh |
| FullChargeCapacity | 0x10 | 0x10 | Read/control | mAh, 10mWh |
| RunTimeToEmpty | 0x11 | 0x11 | Read | minutes |
| AverageTimeToEmpty | 0x12 | 0x12 | Read | minutes |
| AverageTimeToFull | 0x13 | 0x13 | Read | Minutes |
| ChargingCurrent | 0x14 | 0x14 | Read/control | mA |
| ChargingVoltage | 0x15 | 0x15 | Read/control | mV |
| BatteryStatus | 0x16 | 0x16 | Read | n/a |
| CycleCount | 0x17 | 0x17 | Read/control | cycles |

BT-SMART

Latest Register Functions in MITS – Smart Pro Software. Based on TI BQ 2060

| Variable | SMBus Comm Code | | SMBus Access | Units |
|--------------------|-----------------|------------|--------------------|------------|
| | SMBus | HDQ16 | | |
| DesignCapacity | 0x18 | 0x18 | Read | mAh, 10mWh |
| DesignVoltage | 0x19 | 0x19 | Read | mV |
| SpecificationInfo | 0x1a | 0x1a | Read | n/a |
| Manufacturerdate | 0x1b | 0x1b | Read | n/a |
| SerialNumber | 0x1c | 0x1c | Read/control | integer |
| Reserved* | 0x1d-0x1f | 0x1d-0x1f | Read/write/program | — - |
| ManufacturerName | 0x20 | 0x20-0x25 | Read | string |
| DeviceName | 0x21 | 0x28-0x2b | Read/write | string |
| DeviceChemistry | 0x22 | 0x30-0x32 | Read | string |
| ManufacturerData | 0x23 | 0x38-0x3b | Read/write | string |
| Pack Status | 0x2f (LSB) | 0x2f (LSB) | Read/write | n/a |
| Pack Configuration | 0x2f (MSB) | 0x2f (MSB) | Read/write | n/a |
| VCELL4 | 0x3c | 0x3c | Read/control | mV |
| VCELL3 | 0x3d | 0x3d | Read/control | mV |
| VCELL2 | 0x3e | 0x3e | Read/control | mV |
| VCELL1 | 0x3f | 0x3f | Read/control | mV |



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