Regenerative Battery Pack Test System

Model 17020

Features:

- Regenerative battery energy discharge
  - Energy saving
  - Environment protection
  - Low heat generate
- Channels paralleled for higher currents
- Charge / discharge mode (CC, CV, CP)
  - Constant current
  - Constant voltage
  - Constant power
- Driving cycle simulation
- High precision measurement accuracy
- Fast current conversion
- Smooth current without over shoot
- Testing data analysis function
- Data recovery protection (after power failure)
- Independent protection of multi-channel
- BMS data recording
- Thermal chamber control integration

REGENERATIVE BATTERY PACK TEST SYSTEM MODEL 17020

Chroma's 17020 is a high precision system specifically designed for secondary battery modules and pack tests. Highly accurate sources and measurements ensures that the test quality is suitable to perform repetitive and reliable tests this is crucial for battery modules / packs, for both incoming and outgoing inspections as well as capacity, performance, production and qualification testing.

Chroma's 17020 system architecture offers regenerative discharge designed to recycle the electric energy sourced by the battery module either back to the channels in the system performing a charging function or to the utility mains in the most energy efficient manner. This feature saves electricity, reduces the facilities thermal foot print and provides a green solution.

Chroma's 17020 system is equipped with multiple independent channels to support dedicated charge / discharge tests on multiple battery modules / packs, each with discrete test characteristics. The channels can easily be paralleled to support higher current requirements. This feature provides the ultimate flexibility between high channel count and high current testing.

The 17020 advanced hardware design can create seamless transitions between maximum charge and maximum discharge (or maximum discharge and maximum charge) with a rapid 50 ms conversion. This feature allows for charge/discharge modes for simulating real world scenarios.

Chroma's 17020 system has flexible programming functions and may be operated with Chroma's powerful Battery Pro software. Battery Pro utilizes the system to create cycling tests from basic charge or discharge to complex drive cycle testing for each channel or channel groups. A thermal chamber control can be integrated into a profile and triggered by time or test results yielding a dynamic profile. Battery Pro's features allows for quick and intuitive test development to eliminate the need of tedious scripting or programming by a software engineer.

There are multiple safety features including Battery Polarity Check, Over Voltage Protection, Over Current Protection check and Over Temperature Protection to ensure protected charge / discharge testing. In the unlikely event of power or computer communication loss, the data is securely stored in the system, on a non-volatile memory, protecting against potential data loss and allowing for continuous flow after restart.

Ethernet

CE

Chroma

APPLICATIONS

Battery Pack

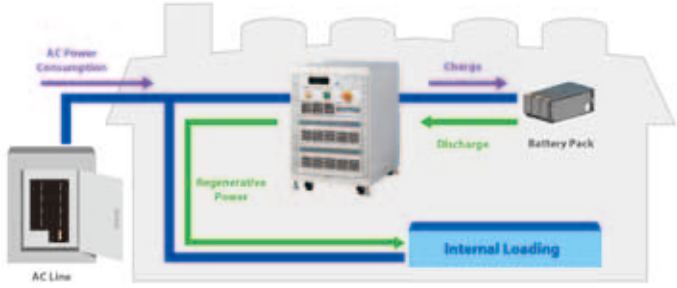
- EV battery module
- Electric scooter/ bike
- UPS
- Electric gardening tools
- Energy storage battery
- Power tools
- Car battery
- Lead-acid battery

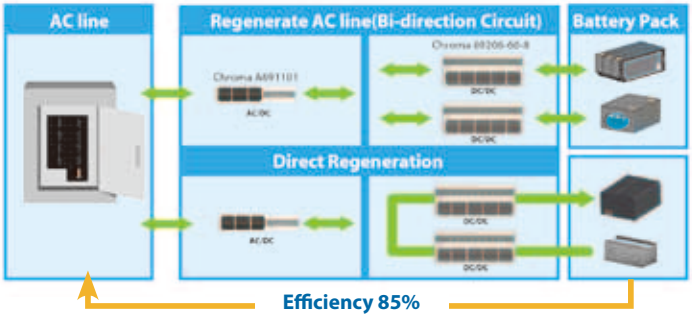
Application

- Drive cycle simulator
- Learning test for manufactory
- Life cycle test
- Balance control test
- DCIR test
- Capacity test
- Performance test
- Reliability test
- Over charge/dischargetest
- Thermal test

REGENERATIVE ENERGY

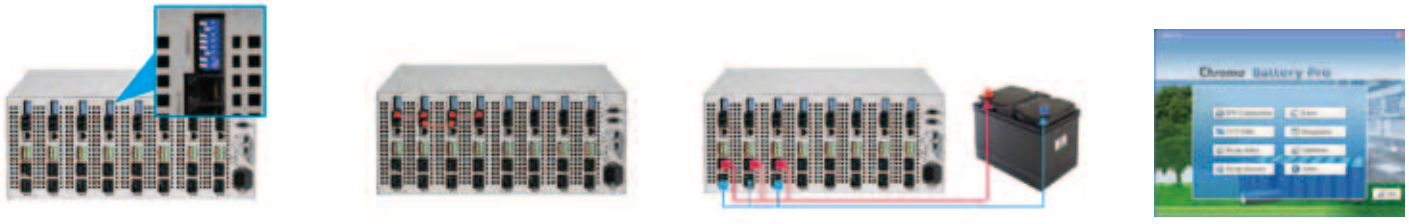
- Regenerative battery energy discharge
  -Direct recycle back to the battery unber charging
  -Regenerate to grid
- Low heat output
- Reduce air-conditioner power consumption
- The THD of 17020 system is under 5% at rated power
- The PF is over 0.9 at rated power
- Return to factory directly





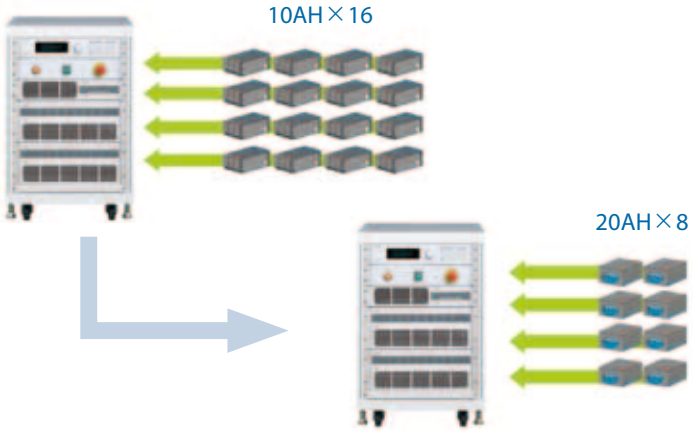
PARALLEL FUNCTIONS

Parallel function



Multi-channels

- Supports various capacity batteries by paralleling
- The system supports different capacity batteries from a base system configuration
- Battery companies have various capacity configurations. Some customers may purchase a high power system to test all capacity battery packs. The downside is that measurements accuracy are not sufficient for small-capacity battery packs. Using Chroma's systems, customers test under individual channels or parallel to test higher capacity battery packs



DRIVING CYCLE SIMULATION

Driving cycle simulation

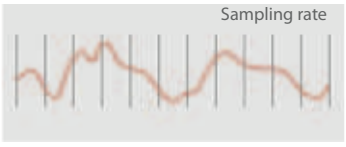
The battery pack always is used at quick and un-regular current condition. The system simulates the real condition on battery pack by working condition simulator.

- Import dynamic charge/discharge power or current waveforms to simulate the DRIVE CYCLE or the actual application.
- Support Excel (xls) format
- There are 720,000 points of driving profile memory to save the waveform profile in each channel.
- Minimum △t：10ms

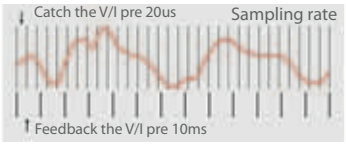
High accuracy capacity calculation

Voltage/current sampling rate of 50kHz used for calculations of capacity ratings in dynamic waveform mode.

- V/I sampling rate : 50KHz
  Minimum data acquisition: 10ms
- Integrate calculus : For I : Capacity
  For V x I : Energy



Other Cycler



Double Integrating Method

17020 FUNCTIONS

Independent Channels

- Independent channel operation
- Independent testing data
- Independent protection
- Independent testing process

Operating mode

- Constant current (CC) mode
- Constant voltage (CV) mode
- Constant power (CP) mode
- Constant voltage-limit current mode (CC-CV)
- Waveform current mode
- DCIR mode
- Rest

Cut-off conditions

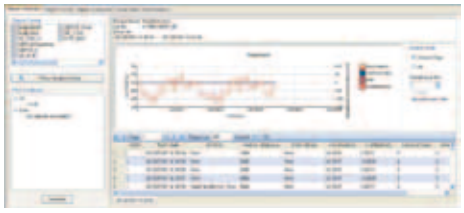
- Time (s)
- Capacity (Ah)
- Voltage (V)
- Current (A)
- Temperature (˚C)
- Channel data in data logger (Option)

Protection conditions

- Over voltage protection (V)
- Under voltage protection (V)
- Over current protection (A)
- Over temperature protection (˚C)
- Over capacity protection (Ah)
- Wire loss protection (△V)
- Channel data in data logger (Option)
- -△V /+△V protection (V)
- +△I /-△I protection (A)
- Delta Protection: Protect internal short of battery cell

Testing data record

- Independent testing data
- Detail report: STEP / TEST TIME / TEST TIME ID / Cycle / Loop / STEP MODE / STEP TIME / VOLTAGE(V) / CURRENT(A) / CAPACITY (Ah) / Energy (Wh) / TEMPERATURE (˚C) / Data Logger Channel (Option)
- STEP / STEP NO / LOOP / CYCLE / STATUS / STEP START TIME / STEP MODE / CUT OFF VOLTAGE(V) / CUT OFF CURRENT(A) / CUT OFF CAPACITY(Ah) / DCIR(mOhm) / Energy (Wh) / TEMPERATURE (˚C) / Data Logger Channel (Option)



Compact Size

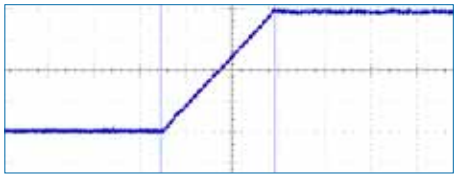
- The dimensions of a regenerative system is smaller compared to a system that has to dissipate energy.

Continuous transition

- Continuous charge and discharge transition: No time delay to transit from charge to discharge. The user can verify the battery pack for a design limit.
- Continuous CC-CV transition: No overshoot current or voltage to damage the battery when transiting CC-CV.

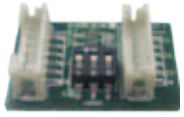
Response time

- The trip time between maximum charge and maximum discharge current is 50ms.
- Smooth current without overshoot for avoiding to damage the battery.



Temperature Measurement

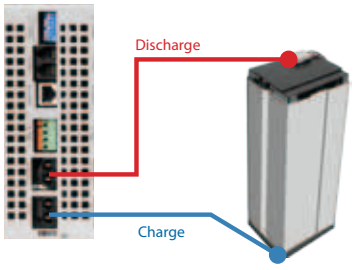
- Temperature measured for each channel within the range of 0~90˚C±2˚C.
- 4 sets of measurements (Max) per channel to measure the battery surface temperature.



Thermal sensor

Test for battery pack with split connections

For some battery pack design, the charge and discharge ports are split to two connectors. Users can set 17020 software to select Charge/discharge going through with a single connector or two connectors separately.



Data Recovery Function

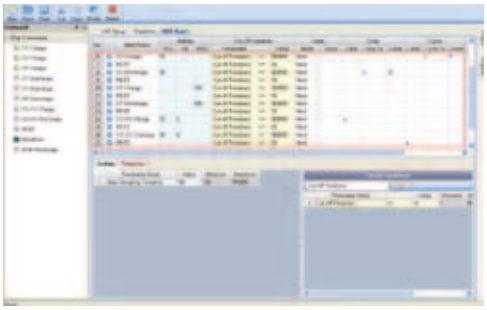
- 60 min of temporary data storage when sampling time is 1 sec.
- Save the test settings to resume after power failure is recovered.

SOFTWARE FUNCTION

The 17020 Test system is specifically designed to meet the various requirements for testing secondary battery packs with high safety and stability. Charge and discharge protection aborts tests when abnormal conditions are detected. Data loss, storage and recovery are protected against power failure.

User friendly

- Real-time multi channel battery pack status browse
- Icon Manager: Test status of each channel is managed through different icons, easy to read and understand.
- Authority management: It sets the user's authority for operation.
- Fault record tracking: It records the abnormal state of each channel independently.



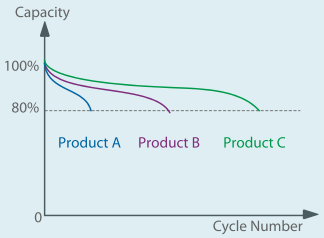
Recipe editor

- 255 charge/discharge conditions
- Sets dual layer loops (cycle & loop) with 9999 loops per layer
- Able to edit dynamic charge/discharge waveform with 10ms current switching speed
- Testing Step: CV / CC / CP / CC-CV / Waveform current / DCIR)
- Cut-off conditions (time, current, capacity, cut-off voltage, cut-off current, etc.)
- Next Step: Next / End / Jump / Rest

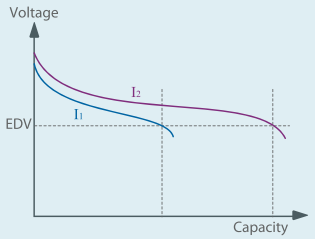
Testing Data

- Generate the detailed report and step report
- Customized report format
- Exports test reports in PDF, CSV and XLS
- Graphical report function
- Report analysis Function: Users can create customized reports such as life-cycle report, Q (AH)-V(V) report, V(V)/I(A)/T(˚C)-time report…etc through the user-defined X and Y axis parameters.
- Real-time browsing test reports of each channel
- Diversified reports & charts: Real-time report, Cut-off report, X-Y scatter chart report

Cycle Life Testing

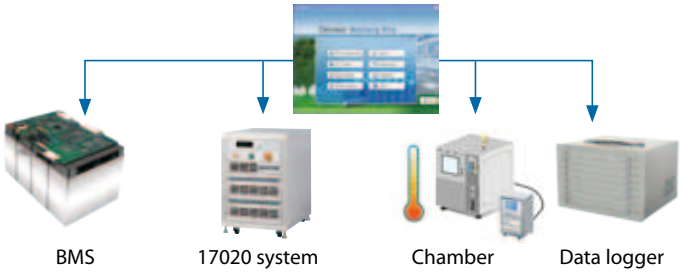


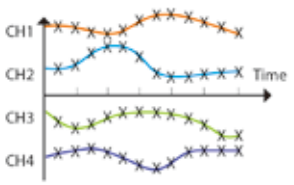
Capacity Measurement



Software integration

- Thermal chamber: Synchronize temperature control with charge/discharge profile.
- Data logger: Temperature or voltage data record. Cut-off and protection conditions setting.
- BMS data record: Software setting to read data from BMS by Data Communication unit A692000/A692001. It supports SmBus and CAN bus. The data can be set the conditions for cut-off or protection during testing.





CHROMA Data logger 51101 provides synchronized sampling with constant data acquisition rate.

Minimun: 200 ms
Interface : Ethernet

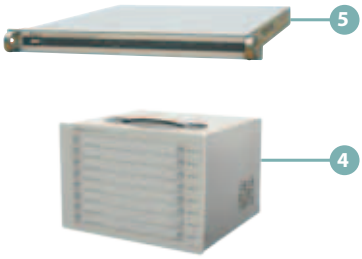
FLEXIBLE SYSTEM CONFIGURATION

17020 Regenerative Battery Pack Test System can be configured to specified requirements and expandable to 60 channels.

1. Battery Charge/Discharge Controller : Model 69200-1
2. DC/AC Bi-directional Converter : Model A691101
3. Regenerative Charge/Discharge Tester : Model 69200 series
4. Data logger (option): Model 51101-64
5. BMS data communication unit

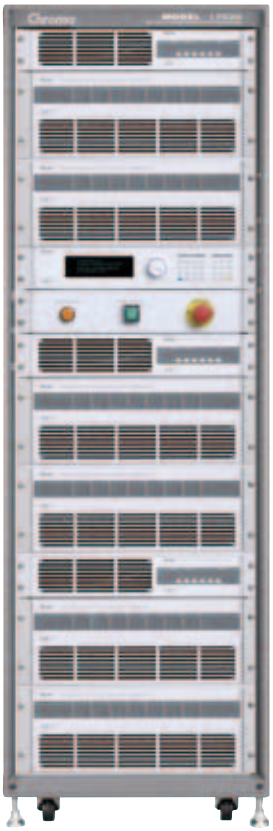
- Support B, E, J, K, N, R, S, and T type thermal couples with ITS-90 defined temperature range
- Individual channel cold junction compensation with <±0.3˚C accuracy
- Temperature resolution up to 0.01˚C,error down to (0.01% of reading+0.3˚C)
- Voltage full range ±10VDC; resolution 10uV; error down to 0.015% of reading+100uV
- No matter how many channels are active, the data rate can be as fast as 5 samples per second per channel.

The driving cable can connect the front panel or rear outlet, users can choose their own.



8 CH

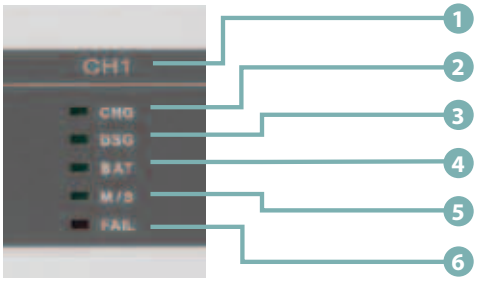
16 CH



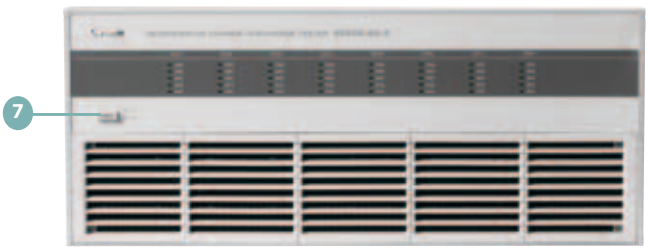
48CH

692XX INTERFACE

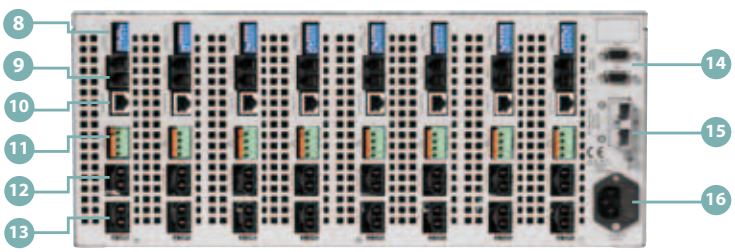
Model 69206-60-8



1. Channel No
2. Charge Status Indicator
3. Discharge Status Indicator
4. UUT Connection Indicator
5. Parallel Indicator
6. Failure Indicator
7. Power Switch
8. Channel DIP Switch
9. Parallel Connector
10. Temperature Meas. Terminal
11. Voltage Meas. Terminal
12. Charge/ Discharge Output/ Input Connector
13. Charge Output Connector
14. Controller Connector
15. DC BUS Terminal
16. AC Input



Front site



Back site

SPECIFICATIONS

Model		69206-60-8	69212-20-4	69212-60-4	69225-60-4	69225-100-4	69225-200-4
Channel		8	4	4	4	4	4
Charge / Discharge Mode	Voltage Range	0-60Vdc	0V-20Vdc	0V-60Vdc	0V-60Vdc	0V-100Vdc	0V-200Vdc
	Maximum Current	13A	65A	62.5A	62.5A	50A	30A
	Max Power	600W	1250W	1250W	2500W	2500W	2500W
	CC mode accuracy	0.1% stg. +0.05% F.S.					
	Current Resolution	1mA	5mA	5mA	5mA	5mA	5mA
	CV mode accuracy	0.1% stg. +0.05% F.S.					
	Voltage Resolution	1mV	0.5mV	2mV	2mV	3mV	5mV
	CP mode accuracy	0.2% stg. +0.1% F.S.					
	Power Resolution	0.1W	0.1W	0.3W	0.3W	0.5W	0.5W
Measurement	Voltage range	0~60V	0~20V	0~60V	0~60V	0~100V	0~200V
	Voltage accuracy	0.02% rdg.+0.02% F.S.					
	Voltage resolution	1mV	0.5mV	2mV	2mV	3mV	5mV
	Current range	4.8A/13A	24A/65A	24A/62.5A	24A/62.5A	20A/50A	12A/30A
	Current accuracy	0.05% rdg+0.05% rng					
	Current resolution	1mA	5mA	5mA	5mA	3mA	3mA
	Power range	0~600W	0~1250W	0~1250W	0~2500W	0~2500W	0~2500W
	Power accuracy	0.12% rdg. + 0.07% rng.					
	Power resolution	0.1W	0.1W	0.3W	0.3W	0.3W	0.3W
	Temperature range	0-90˚C					
	Temperature accuracy	±2˚C					
	Temperature resolution	0.1˚C					
Others	Protection	UVP, OCP, OPP, OTP, FAN					
	Efficiency (Typical)	85~90%					
Temperature Coefficient	Voltage / Current	50ppm/ ˚C					
Dimension(H x W x D)		177 x 428 x 600.7mm / 6.9 x 16.9 x 23.6inch	177 x 428 x 700mm 6.9 x 16.9 x 27.5inch	177 x 428 x 700mm 6.9 x 16.9 x 27.5inch	177 x 428 x 700mm 6.9 x 16.9 x 27.5inch	177 x 428 x 700mm 6.9 x 16.9 x 27.5inch	177 x 428 x 700mm 6.9 x 16.9 x 27.5inch
Weight		38.6kg / 85lbs	37kg / 82lbs	37kg / 82lbs	37kg / 82lbs	37kg / 82lbs	37kg / 82lbs

Model A691101 DC/AC Bi-direction Converter	
Regenerative Bi-Direction Power	
Voltage Range	1Ø 200~240V ±5%, 47~63Hz
Current Range	45A
Current THD/ Power Factor	< 5% / > 0.9 at rated power
Protection	UVP, OCP, OPP, OTP, FAN, Short
Dimension (H x W x D)	83.94 x 425.8 x 696 mm / 3.3 x 16.8 x 27.4 inch
Weight	25kg / 55.2lbs
Model 69200-1 Battery Charge/Discharge Controller	
Data Acquisition Rate to PC	minimum 40ms@4CH independent, 10ms@4CH parallel, 600ms@60CH independent, 100ms@60CH parallel
PC Interface	Ethernet
Dimension (H x W x D)	88.1 x 428 x 420mm / 3.5 x 16.9 x 16.5inch
Weight	9.4kg / 21lbs
General Specifications	
Temperature (Operation)	0˚C ~ 40˚C
Temperature (Storage)	-40˚C ~ 85˚C
Safety & EMC	CE
Input AC Power (Voltage range)	1Ø 100~240V ±10%, 47~63Hz

* All specifications are subject to change without notice. Please visit our website for the most up to date specifications.
Note*1: The output range of voltage is referred by the cabling. The connection between the device and battery is 3 meters long as standard accessory.
Note*2: 20us sampling rate for calculating battery capacity and energy.
Note*3: The maximum discharge current will derate at low voltage range between 2V to 0V, please refer the user's manual for the detail V-I curve.

ORDERING INFORMATION

17020: 600W/60V/13A per channel, 8-56CH
17020: 1250W/20V/65A per channel, 4-60CH
17020: 1250W/60V/62.5A per channel, 4-60CH
17020: 2500W/60V/62.5A per channel, 4-60CH
17020: 2500W/100V/50A per channel, 4-60CH

A170201: IPC for battery pack test system
A692000: Data communication unit (4CH)
A692001: Data communication unit (8CH)
A692003: Thermal sensor and extension cable
51101-64: Data logger, max 64 channels

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