E-MOTOR & DC EMULATOR

ADVANCED POWER EMULATORS FOR VEHICLE ELECTRIFICATION TESTING

HIGH PERFORMANCE, ECONOMICAL, FACILITY FRIENDLY
REDEFINING THE STANDARD.

D&V ELECTRONICS

+ E-Motor Emulator - Significantly lowers infrastructure requirements
+ DC Emulator - Wide Bandwidth, to 20kHz, stimulation or emulation
+ Fully modular, high-precision expandable platforms to fit your needs

High fidelity DC power system and motor drive inverter testing is made achievable with the use of advanced power emulation. D&V Electronics combines leading edge technology and innovative design to produce superior EV/HEV motor drive inverter and DC power system test solutions. Two products, working stand alone or in combination, provide the foundation for vehicle electrification development and production testing.

From individual component testing to full vehicle systems integration testing of component compatibility, these products can interface with your proprietary test automation and data acquisition systems or D&V Electronics can provide a turnkey solution.

D&V Electronics Active Load Emulator (Motor Emulator) mimics all of the characteristics of a permanent magnet or induction motor/generator at full power in all four quadrants with no moving parts under user-controlled speed, torque & temperature conditions thereby simulating an electric drive train.

This electronic dynamometer, with facility requirements suitable for laboratory installations, offers significant advantages in test capabilities and flexibility with low acquisition and operating costs.

Our DC Emulator provides wide bandwidth, up to 20kHz, stimulation or emulation of the DC power system and components. It has the ability to sweep at full power, to frequencies that include the ripple of the emulated component, and provides for full characterization of system resonances and characteristics. Available from 30kW to 2.6MW, this DC source/sink emulates dynamic, complex bidirectional loads with best in class frequency response, deterministic streaming with <1 uS latency, bidirectional full-power slew rate of <100uS and repeatable noise/ripple generation. Ideal for testing vehicle energy systems and components, including batteries, and for HIL with real-time simulation to emulate large switching and regenerative loads to study their effect on the whole power system.

TESTING THE FUTURE®

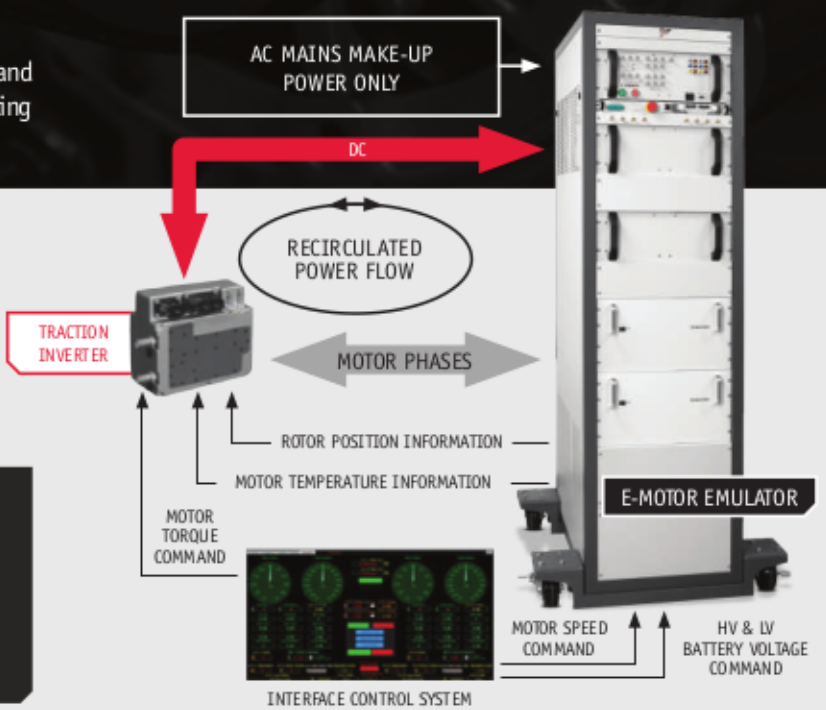
INVERTER TESTING APPLICATIONS

LOCAL POWER RECIRCULATION WITH SIGNIFICANTLY REDUCED INFRASTRUCTURE REQUIREMENTS

+ Electrical: 100A/480V service supports 250kW system, no external isolation transformer required
- Mechanical: single cabinet design with casters can be easily moved, small footprint fits multiple units around thermal chamber

CONFIGURATION 1

D&V Electronics's self-contained system emulates two motors and both the high and low voltage batteries providing high fidelity testing of the electrified power train in a single 19-inch rack.



Battery Emulator:

- ALE includes HV DC Supply and functions as battery emulator
- Controllable
- 500 VDC or 960 VDC modules
- 300 ADC Continuous per Channel | 600 ADV paralleled
- 430 ADV for 20 sec. per Channel | 860 ADC paralleled

E-MOTOR EMULATOR (ACTIVE LOAD EMULATOR)

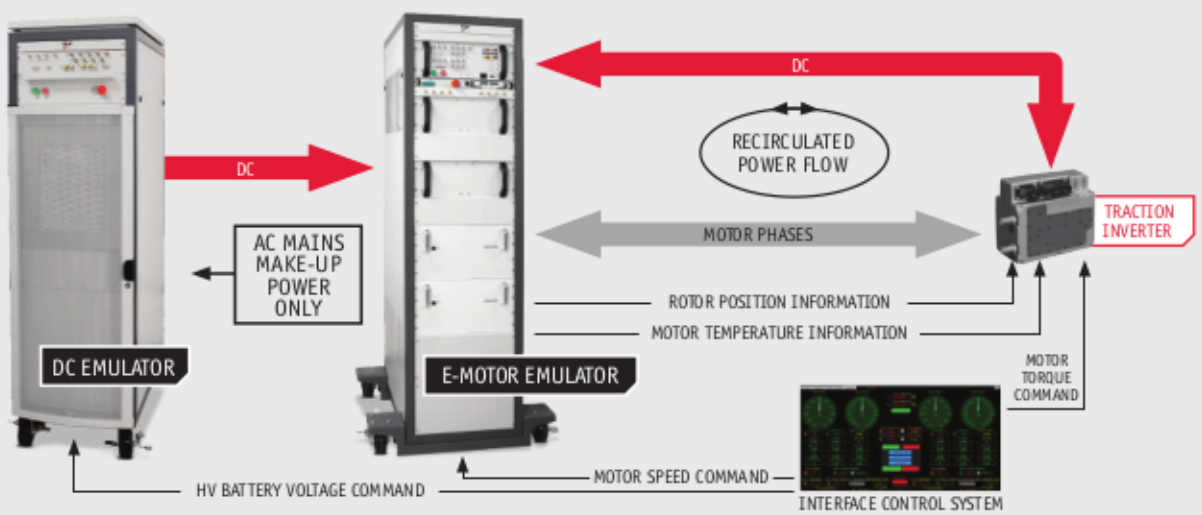
+ Permanent Magnet Motor or Induction Motor Emulation
+ Single or Dual Channel (Dual channel paralleling for 2X AC/DC current)
+ Up to 150kW per Channel; 250kW combined
+ 350A AC RMS Continuous per Channel
+ 550A AC RMS per Channel for 30 seconds

CONFIGURATION 2

Replacing the internal high voltage DC power supply with a DC Emulator provides added Battery Emulator fidelity while offering the flexibility to remove the DC Emulator and operate it as a stand alone system. This configuration continues to take advantage of the local power recirculation while expanding your testing capabilities into Batteries, Battery Chargers and Full Vehicle Systems.

Battery Emulator:

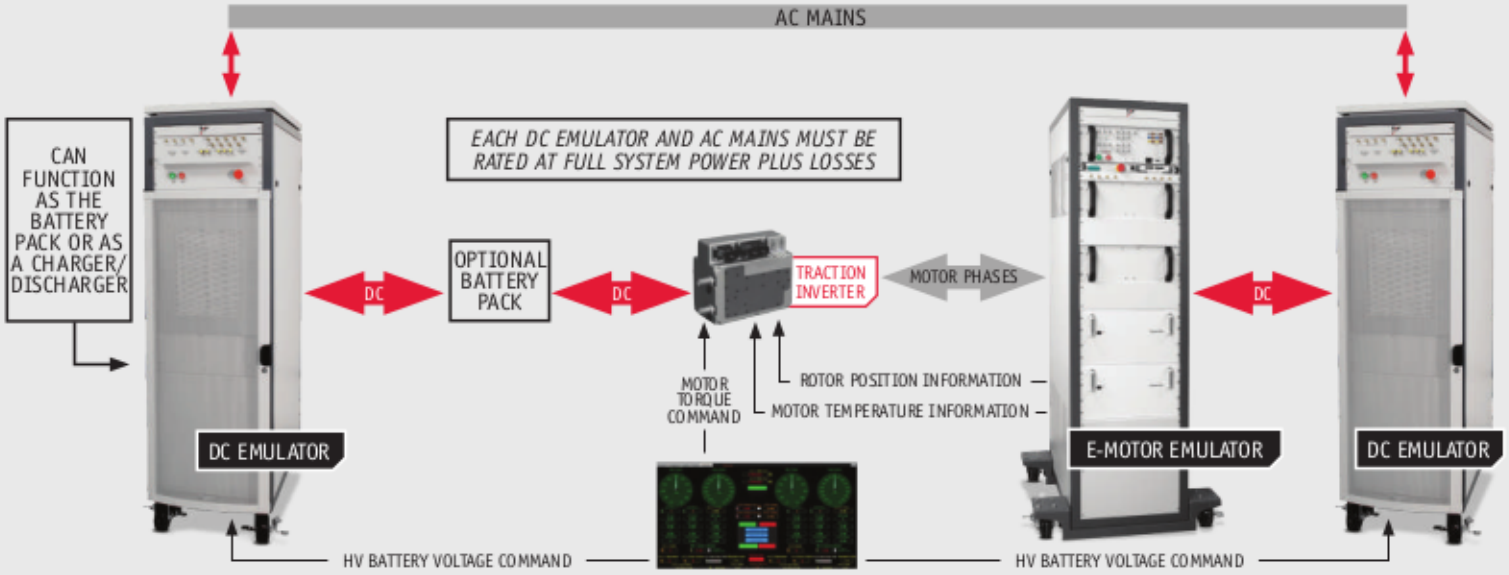
- Controllable with 20kHz Bandwidth
- 100kW; 0 to 500 VDC; ±500A
- Modular - remove and operated as stand along source (application note on next page)
- HIL operation with Fiber Optic Streaming from Real Time Simulation or Test Automation System



CONFIGURATION 3

Combining the E-Motor Emulator and DC Emulators as shown enables power recirculation through the facility AC mains for those unique test situations that require it.

While the facility requirements are significantly increased, the modularity of the DC Emulators enable you to revert back to local recirculation and its inherent advantages, while maintaining the flexibility to configure as shown or operate the DC Emulators as a standalone Battery or Battery Charger tester.



Battery Emulator & High Frequency Load Applications:

Wide bandwidth, to 20kHz, stimulation or emulation of the DC power system:

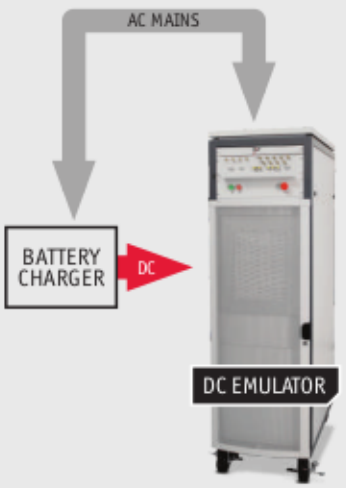
- Ideal for testing batteries and battery chargers
- Best in class frequency response, bidirectional full-power slew rate of under 100uS
- Controlled noise and ripple generation

DC EMULATOR

+ 100kW/0 to 500V/±500A
+ Master/Slave series to 1000V or parallel to 1.3MW or series parallel to 2.6MW
+ Current Transients (+500 to -500A either direction) in <100uS
+ Power Hardware in the Loop with Fiber Optic Streaming from Real Time Simulation or Stored Profiles

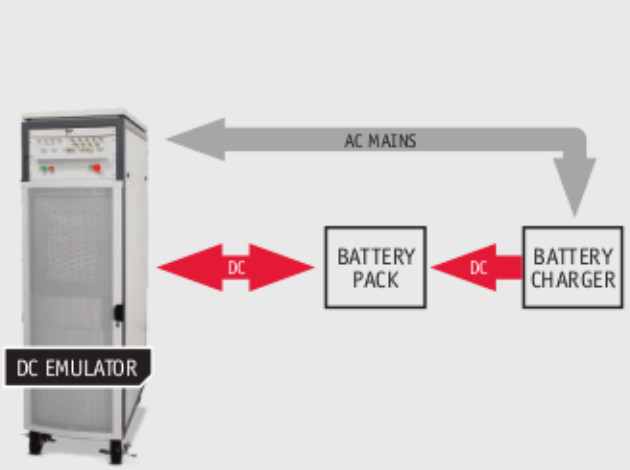
Battery Emulator for Charger Testing:

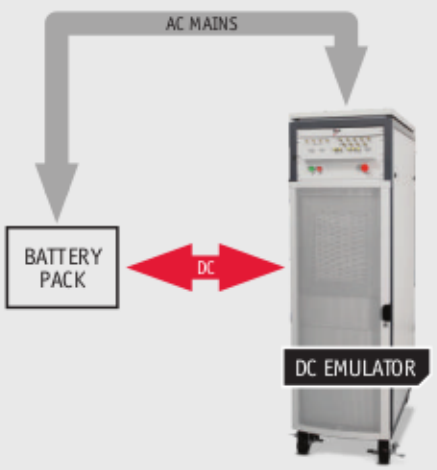
- Wideband Controlled Impedance
- Real Reactive & Nonlinear for Accurate Battery Emulation



High Frequency Load:

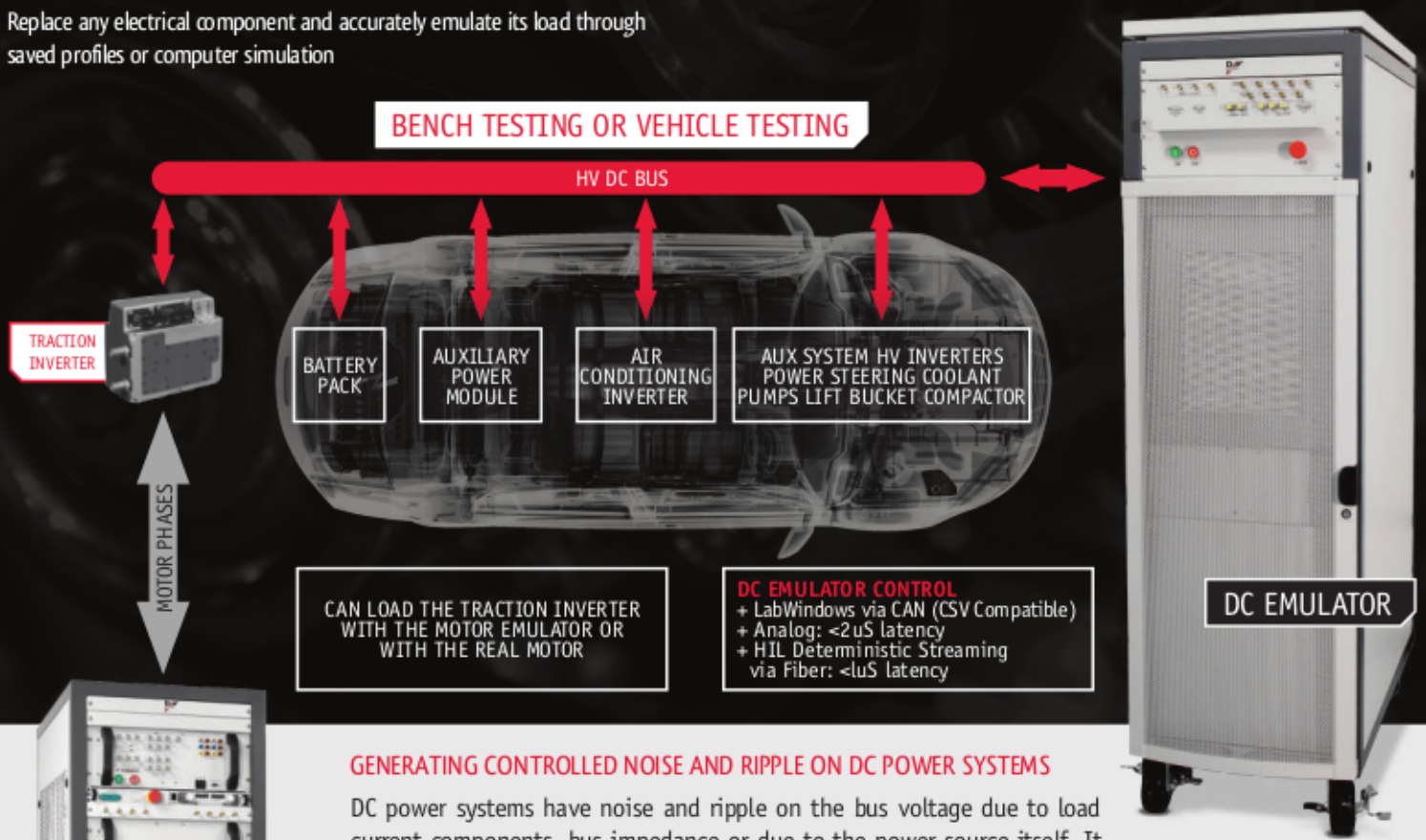
- Generates controlled ripple up to 20kHz to emulate AC components including even the inverter switching frequencies
- Constant Power, Constant Current, Constant Resistance, Constant Voltage
- Power Slew Rate of -100% to +100% Rated Power in <100uS





FULL VEHICLE SYSTEM INTEGRATION AND COMPONENT COMPATIBILITY TESTING APPLICATION

+ Electrical Disturbance Generator at the system level that has the ability to sweep at full power to frequencies that include the ripple of the emulated component
+ Replace any electrical component and accurately emulate its load through saved profiles or computer simulation



GENERATING CONTROLLED NOISE AND RIPPLE ON DC POWER SYSTEMS

DC power systems have noise and ripple on the bus voltage due to load current components, bus impedance or due to the power source itself. It is often beneficial to be able to test for the effects of this noise and ripple on system operation. In order to do so a controlled means of generating repeatable noise and ripple is needed. The D&V Electronics DC Emulator is designed to do just that. It can be configured as a bidirectional load that can load the DC power system up to 500 volts, with DC to 20kHz current components up to +/-500A per unit (series to 1000V, parallel to +/-6500A). The output current waveform can be input via fiber from a stored table, generated by real time simulation, or fed from an analog waveform generator, all with a 2uS or less resolution.

Alternatively, to test a piece of equipment that would be placed on the DC power system and not the entire DC power system, the DC Emulator can be configured as a DC voltage supply, with the same capabilities as stated above, available to supply load currents or charge system capacitance. Voltage slew rates up to 10V/uS can be generated.

D&V Electronics' Emulators for Vehicle Electrification Testing, working standalone or in combination, provide the foundation for vehicle electrification development and production testing. From individual component testing to full vehicle systems integration testing of component compatibility, these products can interface with your proprietary test automation and data acquisition systems or D&V Electronics can provide a turnkey solution.

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