

C A D E X®

Spectro™ CA-12 Battery Tester

**The first automotive battery tester that
reads reserve capacity, cold cranking amps
and state-of-charge in one quick check**



ISO 9001

With the growing demand for auxiliary power on car and truck batteries, the automotive industry needs a tool that can evaluate a battery in terms of reserve capacity. Only by knowing the reserve capacity can a battery be properly assessed.

The slogan goes: *"Starting is easy...
but can I steer and brake?"*

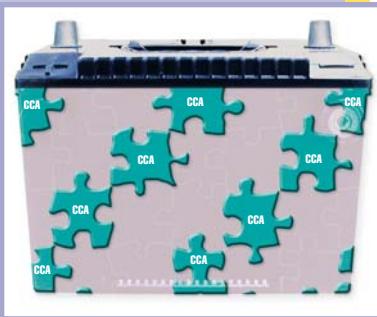
An important need is fulfilled

The Spectro CA-12 is the first in a series of battery testers from Cadex that read reserve capacity (RC), cold cranking amps (CCA) and state-of-charge (SoC) in a single, non-invasive test. Based on multi-frequency *electro-chemical impedance spectroscopy* (EIS), Spectro™ injects 24 excitation frequencies ranging from 20 to 2000 Hertz. The sinusoidal signals are regulated at 10mV/cell to remain within the thermal battery voltage of lead acid. This achieves stable readings for small and large batteries.

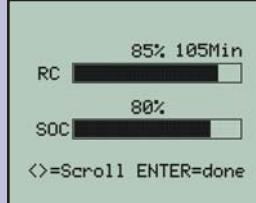
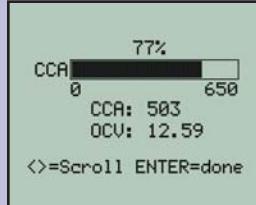
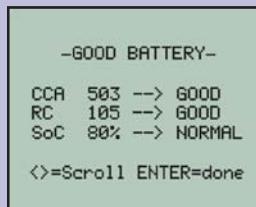
Never has battery testing been so accurate

Being able to measure reserve capacity makes Spectro™ one of the most sought-after test systems for automotive, marine, aviation, defense, wheeled mobility, traction and UPS batteries. Capacity fading due to aging and other deficiencies can be tracked and a timely replacement scheduled. Keeping your batteries longer saves money without sacrificing reliability.

The Spectro CA-12 is packaged in a rugged and ergonomic housing with selective rubber over-molding for good grip. A simple keypad offers quick and intuitive operation.



Single frequency excitation methods keep important battery characteristics hidden. The battery transparency is limited to one level and only a few pieces of the puzzle are available.



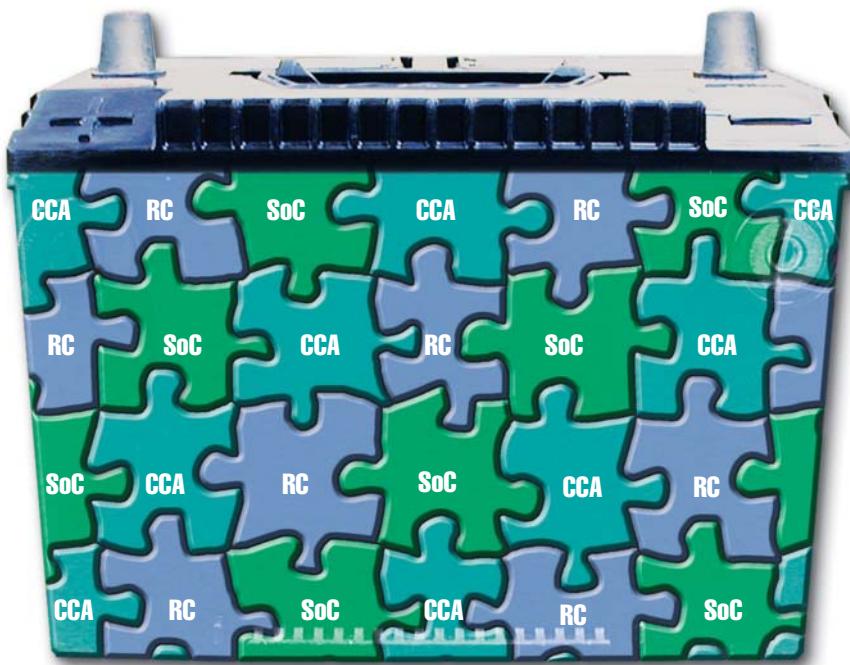
The Spectro CA-12 provides a pass/fail message and displays CCA, RC and SoC.

Why was this not done earlier?

Multi-frequency EIS is very complex and requires the processing of a large volume of data. Collecting the data is easy; making practical use of it is the problem. Lack of high-speed microprocessors and suitable processing methods stalled the development during the last decade. As a result, most battery testers today are based on pulse discharge and single-frequency conductance methods.

A more complete picture is now possible

The Spectro™ CA-12 takes 24 slices of a battery. A patent-pending process evaluates the fine nuances between each frequency to provide in-depth battery assessment. During the 30-second test time, over 40 million transactions are completed. High-speed digital signal processing and advanced data analysis algorithms eliminate dedicated computers and expensive laboratory equipment, peripherals that were required in the past.



Spectro™ provides a detailed landscape of the battery, offering the most complete battery assessment possible. Here, all pieces of the puzzle are available.

A full performance report in 30 seconds

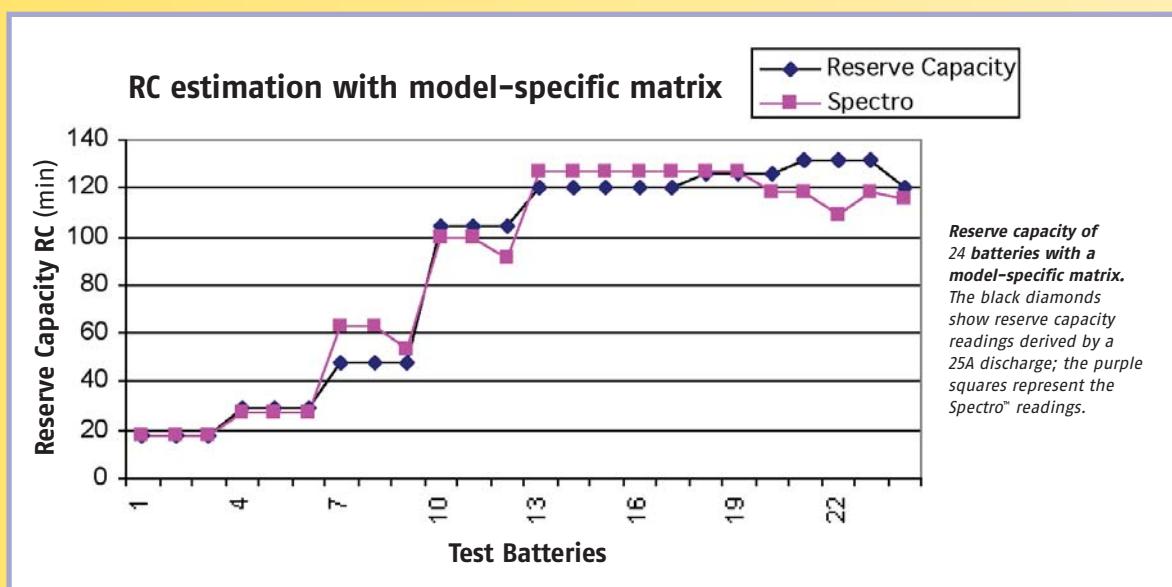
The Spectro™ CA-12 displays the CCA, RC and SoC readings separately. This enables a comprehensive evaluation of the battery in terms of load capabilities, energy storage and state-of-charge. A menu allows the setting of various display standards. The RC can be shown as a percentage of the rated capacity, time in minutes or capacity in Ah.

The Spectro™ readings are more resilient to different charge levels than with other technologies. The results are stable over a wide temperature range and have good immunity to electrical noise. Parasitic loads of up to 30A show minimal side effects. To a large extent, Spectro™ is unaffected by surface charge and acid stratification.

Reserve Capacity readings approach laboratory standards

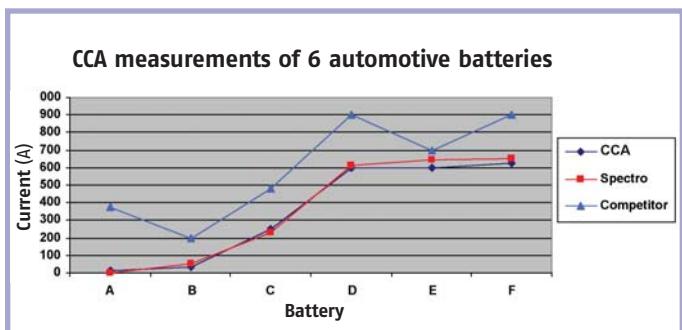
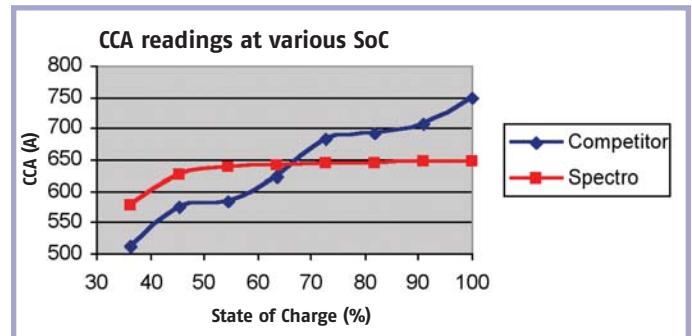
To verify the accuracy of the RC readings, Cadex first measured the actual RC values of each battery (black diamonds on chart below). The test was based on the SAE J537 standard and consisted of a full charge, a rest period and a 25A discharge to 1.75V/cell, during which the reserve

capacity was measured. The tests were then repeated with the Spectro™ technique (purple squares) using battery-specific matrices. The derived results approach laboratory standards, as the chart reveals.



Improved CCA readings

Spectro™ is capable of improving the CCA readings over conventional conductance methods. To verify the results, the actual CCA readings were first established according to SAE J537 (black diamonds on chart below). The batteries were then retested with Spectro™ using a battery-specific matrix (red squares). Spectro™ is capable of producing true CCA values rather than vague results that are common with single-frequency methods (blue triangles).



CCA measurements of 6 batteries. Spectro™ (red) follows the CCA (black) readings very closely. In comparison, the single-frequency method (blue) shows large deviations.

Batteries are often perceived to be faulty because of low charge. Conventional conductance methods yield lower CCA readings with decreasing state-of-charge (blue diamonds on chart above). Spectro™ provides stable results from 50-100% SoC (red squares).

Specifications of the Spectro CA-12

Application	Services 12V lead acid batteries for SLI, marine, golf carts, wheelchairs, UPS systems. (Other chemistries possible with appropriate configurations)
Battery Types	Divided by architecture. The embedded generic matrices* accommodate: - Flooded lead-acid (also includes maintenance free version) - AGM (Absorbent Glass Mat) - Spirally Wound - VRLA (Valve Regulated Lead Acid)
Operating Range	50-1250 CCA; 10-165 minutes; 10-120Ah. CCA, RC and battery type are entered though a prompt command and are remembered on repeat tests
Test Results	- Reserve capacity in minutes or Ah - Conductivity in CCA, MCA, CA, JIS (Japan) DIN - State-of-charge in percentage of full charge - Voltage, 0 – 16V, +/- 50mV - Charger test, taken with various RPM settings in vehicle (on future firmware upgrade)
Test Conditions	Battery must have 50-100% state-of-charge at 0 to 40°C (32 to 104°F)
Test Time	Approximately 30 seconds
Power Source	Internal lithium-ion battery provides 50 full tests per charge; on-screen charge indicator; auto shut-off; 3-hour charge time. Includes AC adapter for global voltages.
Battery Excitation	24 excitation frequencies range from 20-2000 Hertz. The sinusoidal signals are regulated at 10mV to achieve stable readings for small and large batteries.
Languages	Set to English. German, French and Spanish are downloadable from PC-Companion software provided.
Display	Graphic LCD 128 x 64, backlit
Physical	Drop-resistant ABS housing with rubber over-molds to absorb shocks. Dimensions: 172 mm (6.75") x 248 mm (9.76") x 60.5 mm (2.38") Weight: (1.10 kg (2.45 lbs)
Cable	1.8 m (72"), removable, four-wire measurement, temperature sensor in clamp adjusts instrument to adverse temperature conditions, factory calibrated, provision for field calibration.
Printing	Infrared port for printer
Ports	RS232 port, allows field updates through PC
Environmental	Operating temp: 0 to 40°C (32 to 104°F); Storage temp: -20°C to 70°C (-4 to 158°F)
Approvals	UL3101, CSA 1010, EN61010 EMI/EMC: FCC part 15 Class A, EN55011 Level A, EN61000-6-3:2001 for EMC
Warranty	Cadex warrants the instrument against defective materials and workmanship for a period of one (1) year from the original purchase date.

PC-SUPPORT SOFTWARE

PC-Companion On CD-ROM, provides PC-interface to update firmware, download test results, print data, store and review historical data, and examine Nyquist and Bode charts. Software also allows collecting battery data to create battery-specific matrices through Cadex engineering labs.

* Battery-specific matrices provide the most accurate readings.

Specifications subject to change



Customer Satisfaction

When buying Cadex products, you are assured of advanced design, superior quality and competitive pricing. Cadex Electronics has been manufacturing advanced battery test equipment for 25 years. We understand batteries and the importance of what they bring to users. It's because of this that Cadex equipment has earned the trust of battery users worldwide.

Cadex is located on the banks of the scenic Fraser River near Vancouver, Canada



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