



**So you can start the car today . . .**

*but will the battery crank the engine again tomorrow?*

The **Spectro Modular CM-12** measures battery state-of-health by Electrochemical Impedance Spectroscopy (EIS), a technology scientists believe will usher in a new era in battery testing.

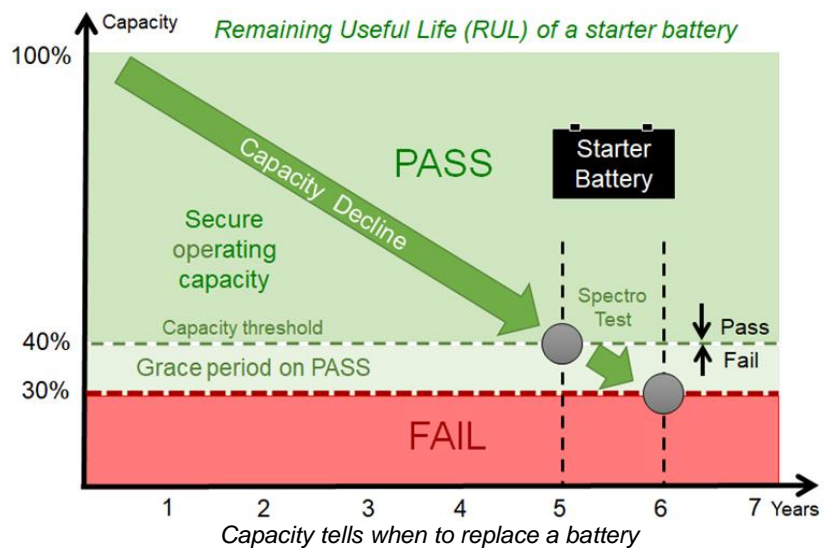
The CM-12 assesses a battery with a non-invasive frequency scan. The compact and rugged test device displays the results on a host by Bluetooth; Cloud Analytics allows storing of data.



### Secret of Battery Capacity

The leading health indicator of a battery is capacity. A “pass” at 40% gives a grace period to the next service; a FAIL calls for a replacement even if cranking is still strong due to low capacity.

Test time is 30s; longer for large batteries. The CM-12 can be configured to test most batteries and also serves as battery QA.

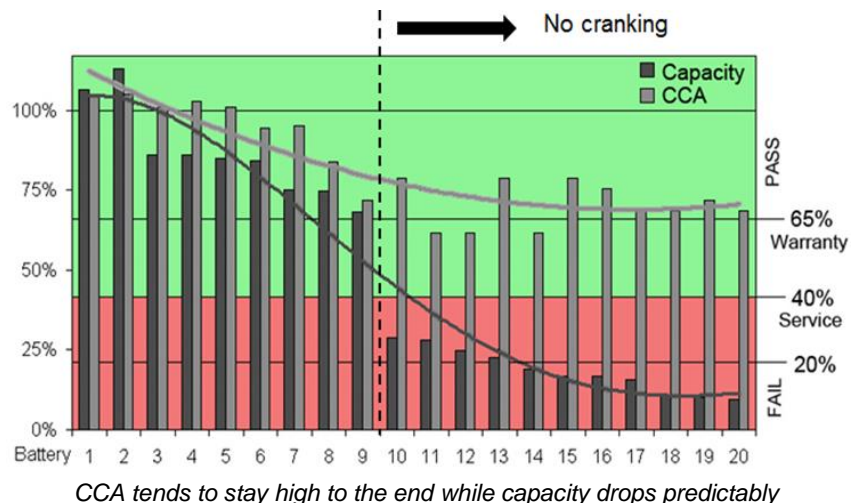


### CCA is not enough

CCA tends to stay strong while the capacity gradually drops, unknown to the driver.

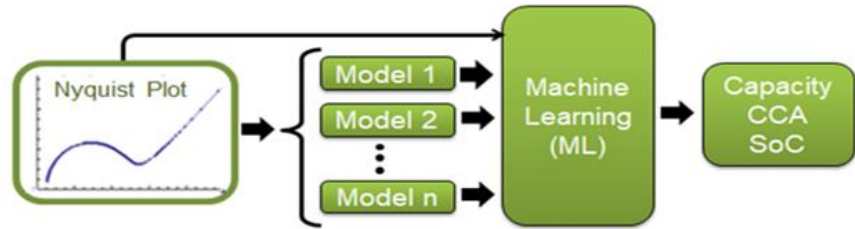
The batteries illustrated on the right deliver acceptable CCA while capacity on some packs dropped below working level.

Field tests reveal that most batteries fail because of low capacity. Only 12% relate to insufficient CCA.



## How does Spectro™ work?

Spectro™ stands on its own. A frequency scan produces a Nyquist plot that is modeled against a matrix to profile the battery. Data fusion calculates capacity, CCA, SoC and other battery health characteristics.



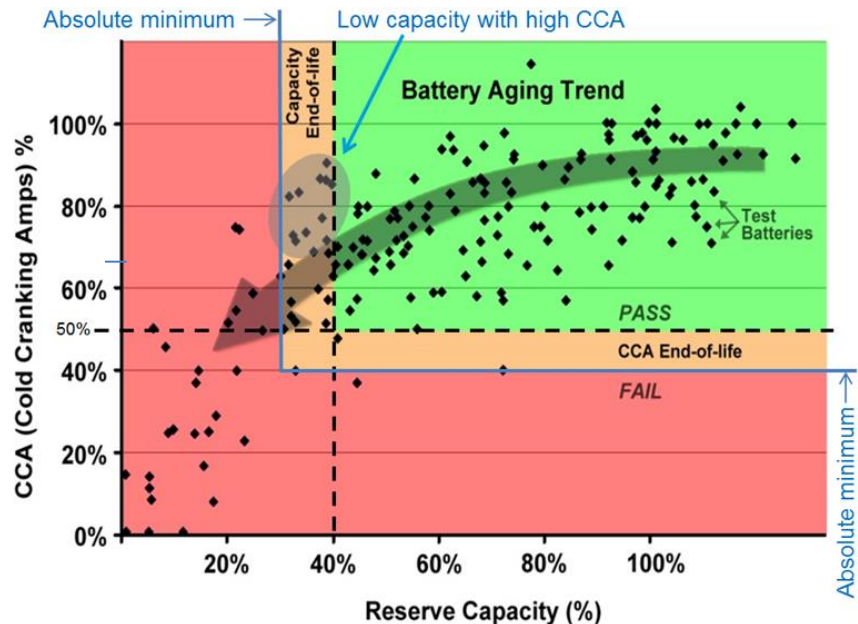
U.S. PATENTS: 6,778,913; 7,072,871; 10,302,709

## Correlation between Capacity and CCA

A German luxury car maker studied capacity and CCA of 175 aging AGM batteries. The resulting graph shows that capacity fade drives batteries through the *Capacity End-of-life* gate that is set at 40%.

Truck and bus batteries may be set to a 50% to allow hotel load. Reading capacity non-invasively with EIS is of special interest on larger batteries.

Spectro™ will also assess real-time capacity when installed into modern Battery Management System (BMS).



## Specifications

- Uses multi-model electrochemical impedance spectroscopy (EIS) to read capacity, CCA and SoC.
- Test time 30s; longer with large batteries with extended frequency scan of 2,000Hz to 0.1Hz.
- Includes generic matrix to service flooded and AGM starter batteries. Other chemistries on request.
- Capacity pass/fail is 40%; CCA is 50%. Other settings on request. Battery must have 50% SoC.
- Test range: 3–12V; 48V on request; 35–300Ah, CCA 2000A. System is non-invasive and stays cool.
- Internal Li-ion battery provides unit power to perform 250 tests.
- Unit connects to a host by Bluetooth and optional connection for cloud analytics
- 1 meter (40") test cable connects to DB15; USB-C charges internal battery with AC adapter
- D: 182mm (7.16"); W: 96mm (3.78"); H: 47mm (1.85"). 430g net (0.94 lb.). comes in transit case:
- Complies with CSA/UL/CE. RoHS. REACH, RED, WEEE, ISTA 3A, IP52 and FCC Type A

**Scientists predict that battery diagnostics will gravitate to EIS**



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ISO 9001, ISO 13485

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