# Statement of Equivalency in the testing of Aircraft Batteries

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**Introduction:**

Making a Statement of Equivalency means to demonstrate that the equipment satisfies the charging and discharging requirements as stated in the CMM[1]'s or OMM[2] of the batteries as specified by the respective battery manufacturers.

The equipment manufactured by JFM Engineering is designed to meet the basic test requirements while providing additional testing performance.

The basic tests are based on providing constant current charge for Nickel-Cadmium Batteries, constant voltage charge for Lead-Acid Batteries, constant current discharge for both types and constant resistance discharge for certain types of batteries.

The manuals for the equipment manufactured by JFM Engineering provide well detailed instructions for calibration as well as for verification of performance.

Verification of Performance is recommended as a first method to establish that the equipment is working properly. It is only if any of the verification tests does not produce correct results that actual calibration (making adjustments) need to be performed.

The equipment called for Verification of Performance includes a reference voltmeter, a reference ammeter (or shunt), a low current variable power source and a battery.

**Constant Current:**

Constant Current is the most important characteristic of battery testing because this is how testing is specified by manufacturers of Nickel-Cadmium batteries, both in charge and discharge.

Constant Current means that the current will maintain the set value independent of battery voltage, power line voltage, temperature, and other associated conditions.

Equipment manufactured by JFM Engineering meets this requirement because it is characterized by very accurate and very stable current. Current stability is either +/- 0.1A, +/- 10mA or, +/- 2mA, depending on the power capability of the Charger-Analyzer and the test mode being used.

Verification of performance requires an external measurement of the current, with an external reference ammeter or shunt having an accuracy of better than 1%. As this is an industry standard practice in many fields, no specific equipment is called for and no further instructions are provided.

**Constant Voltage:**

Lead-Acid batteries require that charge be performed under constant voltage conditions, with an initial current limited to a maximum specified value.

Constant Voltage means that the voltage of the battery will be maintained at the specified value by continuously adjusting (reducing) the charge current as charge is being absorbed in the plates of the battery being charged.

[1] CMM: Component Maintenance Manual
[2] OMM: Operation and Maintenance Manual

Equipment manufactured by JFM Engineering meets this requirement because in the Constant Voltage Mode, the charge current starts at the specified maximum value and remains constant until the battery reaches the specified charge voltage. When the battery reaches the specified charge voltage, the current is automatically adjusted to maintain the required battery voltage.

The transition point is approximately 0.5V to 0.25V under the selected voltage. This provides a very efficient bulk charge operation.

Verification of performance requires an external measurement of the current and an external measurement of the battery voltage. As indicated before, as this is an industry standard practice in many fields, no specific equipment is called for and no further instructions are provided.

**Special Test Modes:**

Some batteries, usually small packs, require a resistive load for capacity testing, as opposed to the constant current loading that is specified for most batteries. This requires that an external, high power resistor be connected to the battery terminals.

Some of the models manufactured by JFM Engineering perform this test with an electronic emulation of the load resistor. The operator needs only to enter the required value of load resistance and a microprocessor continuously calculates the value of the current. This, results in a more accurate test without the difficulties associated with having to provide a suitable load resistor.

Verification of Performance requires to program a value of test resistance, to connect to a power supply (or battery), and at different voltages observe the resulting current. This current must adhere to the basic calculation $I = V/R$ where I is the current observed in the Ammeter, V is the observed voltage (provided by a power supply or a battery) and R is the programmed value of the resistance (in ohms).

**Voltage Settings:**

Most tests involve a measurement of the battery voltage that is used to determine pass/fail conditions as in Capacity Testing and in Charge Overvoltage, or operational conditions such as Constant Voltage Charging and Charge Termination at a peak voltage.

Equipment manufactured by JFM Engineering meets this requirement because it uses precision circuits and high accuracy voltage references to control the tests performed.

Verification of Performance requires that an external variable supply be used to simulate battery voltages and to measure such voltages with a reference voltmeter to determine the accuracy of the voltage performance.

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**JFM Engineering manufactures a product, the VCM-100 where several of the test requirements are made available in one package greatly simplifying the testing process.**

**For additional information, please contact the sales department at 305-592-2272 or visit our website www.jfmeng.com for complete information on our products and services.**

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