

## BIDDLE™ BITE™

- Capable of on-line testing with no downtime
- Test time of less than 30 seconds per cell
- Measures impedance values for all lead-acid and nickel-cadmium cells of less than 2100-Ah capacity
- Measures impedance of valve regulated (VR) sealed cells

# Battery Impedance Test Equipment

## DESCRIPTION

Biddle™ BITE™ Battery Impedance Test Equipment is used for on-line, static device testing of standby batteries to determine cell condition by providing data for impedance analysis.

Independent research indicates that internal battery cell impedance increases with the age and discharge history of a cell. The BITE is used to test for sulfating, post-seal corrosion, poor intracell connections and poor intercell operation.

Unlike load cycle testing, which involves substantial downtime and repeated discharges, the BITE requires no battery discharge. With a test time of less than 30 seconds per cell, the unit quickly and accurately measures internal cell impedance without going off line.

The system consists of a low-frequency transmitter, a line cord, connection cables and the receiver, which calculates and digitally displays the impedance measurement.

## APPLICATIONS

The BITE measures impedance values for all lead-acid and nickel-cadmium cells of less than 2100-Ah capacity. Specific system environment may permit testing of larger Ah cells. This information lets the operator determine cell replacement criteria based on impedance trends. The BITE also identifies weak cells in a battery string and pinpoints unsatisfactory intercell and/or intertier connection conditions. Unsuitably high ripple current that results from a poor battery charger condition can also be identified using the BITE.

## FEATURES AND BENEFITS

- Testing is done on-line; no downtime is required.
- Impedance calculations are done automatically; no control settings or adjustments are needed.
- Requires no battery discharge
- Test time of less than 30 seconds per cell
- Measures impedance values for all lead-acid and nickel-cadmium cells of less than 2100-Ah capacity

## Test Procedure

The BITE consists of a transmitter and a receiver. (See Figure 1.) The transmitter provides a capacitively coupled ac current to the battery under test. The receiver unit

is clamped around a battery intercell connector, and potential probes measure the ac voltage across the cell. The measuring circuitry reads the true rms current and voltage data and then computes and displays this information in an impedance format. These impedances may also be recorded for trend analysis. (See Figures 2 and 3.)

## Interpretation of Readings

Data produced by the BITE can be interpreted in both short- and long-term time frames. It is recommended that BITE measurements be made a part of a battery maintenance program, with readings taken and recorded semi-annually. An impedance distribution plot may assist in the analysis.

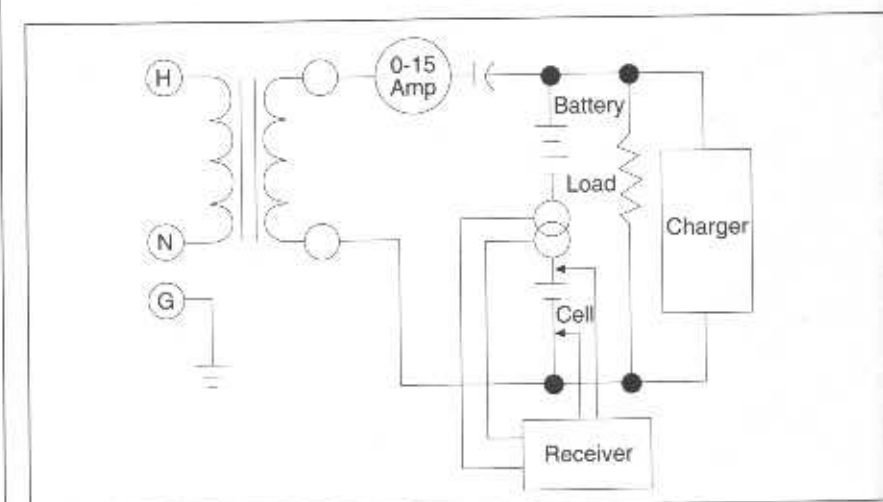


Figure 1: Schematic diagram of typical test setup

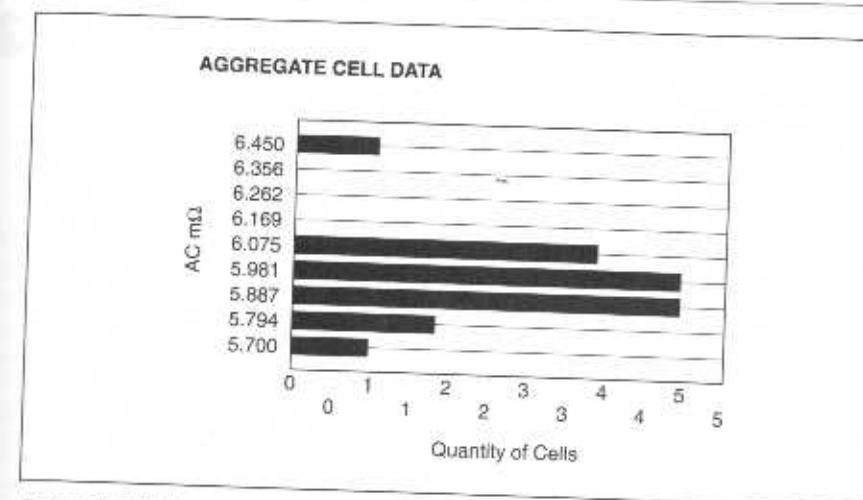


Figure 2: Milliohm comparisons as a function of cell numbers

## Short-Term Interpretation

Impedance readings for individual cells can be used in the short term to compare with the average impedance reading for the entire battery. Individual cell values varying by more than  $\pm 20\%$  of the battery average typically indicate a problem with that cell. (See Figure 2.) Additional investigation of such cells is recommended, including a verification of intercell connections and a load-cycle test.

## Long-Term Interpretation

Impedance readings for the entire battery can be used in the long term to determine replacement criteria. Battery cell impedance values should be recorded and compared to past readings to determine the cell's position on the curve of impedance versus cell life. A sample curve is shown in Figure 3.

Baseline impedance values are not provided by battery manufacturers; however, a data base of impedance values by manufacturer and battery size/type is maintained for some manufacturers and sizes. For comparison purposes, this information is available upon request.

## SPECIFICATIONS

### Application

All lead-acid and nickel-cadmium cells of less than 2100-Ah capacity. Tests on some battery systems may be constrained by 2-in. (51-mm) max. opening of clamp-on meter and physical installation of cells.

### Maximum Total Voltage at BITE Source

Leads: 250 Vdc. Larger battery systems can be sectioned to accommodate this specification.

### Power Requirements

Transmitter: 120 Vac, 60 Hz (240-Vac, 50 Hz on -47 models)  
Receiver: Three 1.5-Vdc alkaline AA cells  
Battery Life: 40 h minimum

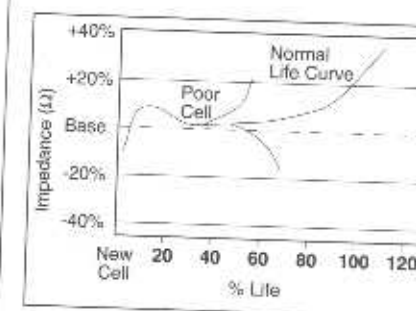


Figure 3: Impedance as a function of cell life

## ORDERING INFORMATION

Item (Qty)	Cat. No.	Item (Qty)	Cat. No.
BITE Battery Impedance Test Equipment		Receiver-to-cell leads terminated in single helical spring points (2)	29435-1
120 Vac, 60 Hz	246001	Power cord for standard grounded outlet (1)	17032
240 Vac, 50 Hz	246001-47	Batteries, 1.5 V (3)	23415
<b>Included Accessories</b>		Data pad (50 sheets)	246009
Transmitter	29380	Instruction manual	AVTM246001J
Receiver	29430		
Leads terminated in alligator clips (2)	29386-40		

## Display

Transmitter: Analog meter scaled 0 to 15 A ac,  $\pm 5\%$  accuracy

Receiver: 3½-digit LCD

## Ranges

0 to 1.999 mΩ; 1-μΩ resolution  
0 to 19.99 mΩ; 10-μΩ resolution

Accuracy:  $\pm 5\%$  of full scale over operating temperature range, with current greater than 5 A through cell under test

## Error Messages

Lo\_b (V) — Low battery indication

Err — Invalid data - divide by 0

Lo (A) — AC sensor current too low

Hi (mΩ) — Impedance over-range

Settling Time per Reading: 3 s max.

## Temperature

Operating: 32 to 104°F (0 to 40°C)

Storage: -4 to +131°F (-20 to +55°C)

## Clamp Range

Receiver: 2 in. (51 mm) max.

## Interconnections

Two 40-ft (12-m) transmitter-to-battery (source) leads terminated in alligator clips

Two 8.5-ft (2.6-m) receiver-to-cell (potential) leads terminated in single helical spring points

One 6-ft (1.8-m) power cord for standard grounded outlet

## Dimensions

Transmitter (with case closed)

12 H x 20 W x 11 D in.  
305 H x 508 W x 280 D mm

## Receiver

8.25 H x 3.25 W x 1.5 D in.  
210 H x 83 W x 38 D mm

## Weight

Transmitter: 35 lb (15.7 kg) approx.  
Transmitter case houses receiver, probes, source leads and instruction manual.

Receiver: 1 lb (0.5 kg) approx