Battery Impedance Test Equipment

DESCRIPTION
The Biddle® EBITE and BITE2 are designed for on-line ac impedance and dc terminal voltage measurements of secondary batteries. These measurements, along with other maintenance data such as ambient and pilot cell temperatures and ac ripple currents, assist in determining the overall battery system condition. Unlike load cycle testing that involves substantial downtime and repeated discharges, using the EBITE or BITE2 requires no battery discharge. With a test time of less than 30 seconds for each cell, the units quickly and precisely measure internal cell impedance and dc terminal voltage without taking the battery system off line. Housed in a rugged case with built-in carrying handle, the EBITE and BITE2 are easily operated by one person.

RECEIVER
The receiver incorporates the potential leads, clamp-on current sensor, and data storage capabilities in one unit. It stores more than 2000 sets of data (cell impedance, cell voltage and interconnecting strap resistance).

At any time while performing a test, the operator can review the current test results by using arrow keys and scrolling back through the active test screen. If needed, the operator can retest any of the cells and straps in the current test before the results are downloaded.

Battery Analysis Report
FENWICK SUB. 95

Notes: 05/05/95

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<th>Notes</th>
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<th>Rs</th>
<th>Volts DC</th>
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Cell Impedance Summary

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<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
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<tr>
<td>2.34</td>
<td>2.48</td>
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Percent Deviation from Average

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<th>-10</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
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</table>

Figure 1: Sample battery analysis report printout

Stored data in the receiver can also be downloaded via the RS-232 connector directly to a personal computer or to the EBITE transmitter.

The clamp-on current sensor is connected to the receiver during testing and clamped around a convenient intertier or intercell connection within the loop created by the current source leads from the transmitter and the battery string.

If the intercell or intertier connection used consists of more cables than the diameter of the clamp-on current sensor can encompass, the receiver has a split-strap function.

With the optional bar-code wand, additional information can be recorded and stored such as location ID, ambient and pilot cell temperature.

The receiver is powered by internal rechargeable batteries and are charged with a separate external charger.

TRANSMITTER
The transmitter provides the capacitively coupled ac test current to the cells under test via the current source leads. The EBITE transmitter has an LCD and built-in printer, while the BITE2 transmitter features a large analog current meter.
Data collected and stored in the receiver can be downloaded to the EBITE transmitter where it can be reviewed and printed but not retested. Figure 1 shows a sample printout of a battery analysis report. Data collected can also be downloaded from the EBITE transmitter directly or exported via a modem to a personal computer.

APPLICATIONS

Independent research indicates that internal battery cell impedance increases with the age and discharge history of a cell. The EBITE and BITE2 test for sulfating, post-seal corrosion, poor intracell and intercell connections. This information lets the operator determine cell replacement criteria based on impedance trends.

Typical installations that can be tested using the EBITE and BITE2 include electrical power generation plants and substations, telecommunications facilities, UPS systems, aircraft power supplies, and marine and military applications.

FEATURES AND BENEFITS

- On-line testing requiring no downtime.
- Calculates impedance automatically and stores results for on-site review.
- Requires no battery discharge.
- RS-232 connector for downloading stored data to a personal computer.
- Reduces test time; less than 30 seconds for each cell.
- Measures impedance and dc voltage values for all lead-acid and nickel-cadmium cells of less than 2500 Ah capacity. (Specific system environment may permit testing of larger Ah cells.)
- Stores more than 2000 sets of readings.

TEST PROCEDURE

The transmitter provides a capacitively coupled ac current to the battery under test through the current source leads.

The CT is connected to the receiver and then clamped around a convenient battery intercell or intertier connection within the current loop created by the current source leads. The receiver’s potential probes are placed across the cell under test. The receiver shows the calculated impedance and the dc float voltage of the cell under test. The information can be verified by the operator and then stored by pulling the trigger on the receiver.

The intercell/strap resistance measurement is made and stored by placing the potential probes across this connection and pulling the trigger. Figure 2 shows a typical test setup.

Interpretation of Readings

Data produced by the EBITE and BITE2 can be interpreted in both short and long-term time frames.

AVO International recommends that impedance measurements be made part of a battery maintenance program with readings taken and recorded semiannually. An impedance distribution plot assists in the analysis.

Short-Term Interpretation

Impedance readings for individual cells can be used in the short term to compare with the average impedance readings for the entire battery string. Individual cell values varying by more than ±20 percent of the battery average typically indicate a problem with that cell.

AVO International recommends additional investigation of such cells including a verification of intercell connections and a single cell load-cycling 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 previous readings to determine the position of the cell on the curve of impedance versus cell life.

Baseline impedance values are not provided by most battery manufacturers; however, AVO International maintains a database of impedance values by some manufacturers and battery size/type. For comparison purposes, this information is available upon request.

SPECIFICATIONS

Application

The EBITE and BITE2 tests lead-acid and nickel-cadmium cells of less than 2500 Ah capacity. (Specific system environment may permit testing of larger Ah cells.)

Maximum Total Voltage at Current Source Leads:

250 V dc (larger battery systems can be sectioned to accommodate this specification)

Transmitter

Supply Voltage

100 to 130 V, 50/60 Hz, 200 VA max
210 to 250 V, 50/60 Hz, 200 VA max
(-47 model)

Source Output Current

9.4 A nominal at 60 HZ operation
7.8 A nominal at 50 HZ operation

Maximum Battery Test Voltage

250 V dc at source lead terminals

BITE2 Analog meter

0 to 15 A

EBITE Display

Digital LCD meter, 240 x 64 pixel, 5.2 x 1.5 in. (132 x 39 mm) viewing area
EBITE Printer
Built-in thermal, with 4.25 in. (110 mm) printing width

Charger
Supply Voltage
100 to 130 V, 50/60 Hz, 14 VA
210 to 250 V, 50/60 Hz, 14 VA
Output
6.50 V dc @ 1.10 A dc charging (max)
9.60 V dc open circuit

Receiver
Accuracy
dc voltage ±(1% of rdg + 1 LSD)
ac impedance ±(5% of rdg + 0.7% fs)
Voltage Range
0 to 2.500 V dc 1 mV resolution
2.5 to 25.00 V dc 10 mV resolution
Impedance range
0 to 1.000 mΩ (1 µΩ resolution)
1 to 10.00 mΩ (10 µΩ resolution)
10 to 100.0 mΩ (0.1 mΩ resolution)
Setting Time per Reading
3 seconds maximum

Supply
4.8 V dc, 800 mAh, quick charge nickel-cadmium battery pack

Battery Pack Life, Full Charge
5 hours continuous

Maximum Battery Test Voltage
25 V dc between receiver potential probes

Display
Digital LCD meter, 5 x 7 dot matrix,
2 line 16 character, 2.19 x .43 in. (55.7 x 11 mm) viewing area

Temperature
Operating: 32 to 104°F (0 to 40°C)
Storage: -4 to 131°F (-20 to 55°C)

Humidity: 20 to 90% RH, noncondensing

Clamp Range
Standard 2.0 in. (50.8 mm)
maximum opening
Optional 0.5 in. (12.7 mm)
maximum opening

Safety
Designed to meet IEC 1010 specifications

Dimensions
Transmitter
BITE²
7.5 H x 11.25 W x 9.75 D in.
19.05 H x 28.58 W x 24.76 D cm
EBITE
12 H x 19.6 W x 11.1 D in.
30.4 H x 24.3 W x 28 D cm
Receiver (irregular shape)
7.25 H x 11.25 W x 2 D in.
18.4 H x 29.2 W x 5.1 D cm

Weight (total)
Transmitter
BITE²: 15 lb (6.8 kg)
EBITE: 32.9 lb (14.9 kg)
Receiver: 1.6 lb (0.72 kg)

ORDERING INFORMATION

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<th>Item</th>
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<td>EBITE, 120 Vac, 60 Hz</td>
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<td>EBITE, 240 Vac, 50 Hz</td>
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<td>EBITE, 120 Vac, 60 Hz</td>
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<td>EBITE, 240 Vac, 50 Hz</td>
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<td>BITE², 120 Vac, 60 Hz</td>
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<td>EBITE, 240 Vac, 50 Hz</td>
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Included Accessories

Transmitter
for Cat. No. 246002 ........................................... 33660
for Cat. No. 246002-47 ....................................... 33660-1
for Cat. No. 246003 ........................................... 30630-1
for Cat. No. 246003-47 ....................................... 30630-2

Receiver
for Cat. No. 246002 and 246003 ................................ 246301
for Cat. No. 246002-47 and 246003-47 ...................... 246301-47
Current source leads, 20 ft (6 m), fused .................. 29386-2
Current sensor, 2 in. (50 mm) opening
with 5 ft (1.5 m) lead ......................................... 33863
CT extension cable, 6 ft (1.8 m) ......................... 33864-1
Communication cable, 6 ft (1.8 m)
with 25-pin to 9-pin adapter ............................... 30648
Battery charger ............................................. 33497-1
Thermal paper (EBITE) ..................................... 26999
Data extraction tools for Windows® ..................... 33734

Optional Accessories

Current sensor 0.5 in. (12.7 mm) opening
with 2.5 ft (0.8 m) lead ....................................... 246034
CT extension cable, 20 ft (6 m) ............................ 246033
Current source leads, 10 ft (3 m), fused .................. 246147
Current source leads, 30 ft (9.1 m), fused ............... 246347
Current source leads, 40 ft (12.2 m), fused ............. 246447
Bar-code wand with preprinted code sheet ............. 246201
Bar-code labeling software
DOS ............................................................. 246040
Windows® .................................................... 246039
Instrument canvas carrying case
for Cat. No. 246002 ........................................... 218746
for Cat. No. 246003 ........................................... 246010

AC line cord, 8 ft (2.4 m)
for Cat. No. 246002 and 246003 .......................... 17032
for Cat. No. 246002-47 and 246003-47 ................. 4127-2
Canvas accessory bag ...................................... 29996
Instruction manual
for Cat. No. 246002 ......................................... AVTM246002J
for Cat. No. 246003 ......................................... AVTM246003J

Instrument canvas carrying case
for Cat. No. 246002 ........................................... 246010
for Cat. No. 246003 ........................................... 246010