Additional Information

Why Mhos instead of Amp Hours

The ***LifeTester*** measures the conductance (Mhos) of a battery using an AC impedance measurement algorithm. Every battery manufacturing process produces a slightly different conductance value for a given battery size. Elk Products elected to display consistent, accurate conductance values in Mhos, rather than just estimated Amp Hour values. The only accurate method for measuring a battery's Amp-hour capacity is with a long discharge test, which actually decreases the life of the battery. Estimation of Amp-hour capacity without a discharge test is a complex error-prone process involving the conductance value, the battery state-of-charge, the voltage, the temperature, and the many varying design and production variables for each battery type. Ordinary testers which measure static criteria or Amp-hours are inherently inaccurate across varying battery designs. In contrast, extensive testing has proven that when the conductance of a charged battery is tested and has declined to approximately 70% of its full-capacity reference, the battery is unlikely to deliver more than 80% of its rated capacity and should be replaced.

Is Mhos relational to Cold Cranking Amps

The ***LifeTester*** is designed to measure the conductance of a battery at frequencies indicative of the capacity of a battery in Amp-hours. Conductance measurements for estimating the Cold Cranking Amps for starter type batteries are at a much higher frequency. Although the measurement techniques are similar, there is little correlation between the Cold Cranking Amps measurement of a battery and the Mhos reading of the ***LifeTester***, or vice-versa.

Using Mhos to Estimate Battery Life

The Mhos reading of a new battery out of the box, will generally not be the same as that of a fully charged battery. This is due to the plates not being totally formed during manufacturing. Once the battery has been on charge for some time the plates will finish forming and the peak Mhos reading will normalize. For standby batteries, peak capacity is normally reached after about three months on a float charging system. For cyclic use batteries, full capacity may not be reached until after ten to thirty cycles, depending upon the depth of discharge and the charging method.

Additional Information

If a new battery has been in storage for an extended period, say over six months without being charged, plate oxidation from self-discharge will occur, causing a decrease in the Mhos reading. Plate oxidation also occurs in standby batteries during a power failure, particularly if a battery remains in a highly discharged state for an extended time period. Plate oxidation is unhealthy and can destroy a battery's capacity. Once a battery is weakened by plate oxidation, it is difficult to recover full capacity without special charging or conditioning methods. In some cases a battery will recover and pass a test after being recharged. However, a second test should be performed a few days after recovery to accurately assess the overall life of the battery.

The average life cycle of a sealed lead-acid battery in standby use on a float charge is 3 to 5 years. A battery with a Mhos reading of less than 70% of its **Charged, Full Capacity** value is no longer considered serviceable and should be replaced.

Accumulating Trend Analysis over a Period of Years

Trending of periodic conductance measurement data can yield valuable insights for estimating the remaining life of the battery. For instance, suppose that a battery has been in service for three years and that the ***LifeTester*** measurements after the 1st year was 99% of the **Charged, Full Capacity** reference, 96% after the 2nd year, and 93% after the 3rd year. Since the battery is still at 93% of the reference value, and is only dropping about 3% per year, it is highly likely that this battery will not need replacing before the end of the 4th year. On the other hand, suppose that the readings were 98% after the 1st year, 91% after the 2nd year, and 81% after the 3rd year. The rate of decay has increased from 2% to 7% to 10% per year. This indicates that although the battery is still serviceable, it is degrading more and more rapidly. It is unlikely that this battery will still be serviceable for another year. Under these circumstances, either the battery should be replaced early or the service interval should be shortened to catch this battery before a system failure.

Additional Information

Adding to the Battery Reference Chart

If the battery you are trying to test is not included in the **Battery Reference Chart** it may be necessary to research and generate the data on your own. The following procedure will help with this task.

Adjust the reference setting of the ***LifeTester*** to zero according to the instructions under ADJUSTING THE REFERENCE SETTING. This will put the ***LifeTester*** into a mode to display the temperature compensated Mhos reading at the end of the test.

Start with fresh new batteries out of the box. The battery voltage should be around 12.6 Volts or higher. Place the batteries in service (on charge) for 24 hours. Remove them from charge and measure the peak Mhos readings. Average the peak values of the test batteries and record this value in the Mhos rEFerence column on the Battery Reference Chart. For cyclic use batteries, test each battery after each discharge-and-charge cycle until the measurement peaks. Then average the peak values just as for standby batteries.

FEATURES

- Compact, low cost, and easy to use.
- Does not discharge or damage the battery.
- Analyzes 12 Volt Rechargeable Batteries up to 65Ah
- LED display shows: Mhos value, reference setting, battery voltage, ambient temperature in Fahrenheit or Celsius, percentage of reference setting, or temperature compensated Mhos value.
- Warns if battery voltage is too low.
- Warns if battery should be replaced.
- Temperature compensated for all environments.
- Replaceable test leads.
- Reverse polarity indicator.
- Improper test lead connection warning.
- Includes padded carrying case.
- Lifetime Limited Warranty.

SPECIFICATIONS

- Operating Voltage: 12.3V - 14 Volts D.C.
- Current Draw: 1.1 Amps Max., 0.0016 Ah for full test
- Battery Leads: 12 Inches
- Size: 4.4" W x 3"H x 1.15"D w/o carrying case

- For the most accurate results a battery should be allowed to charge for 24 hours prior to testing. In addition, the ***LifeTester*** should be allowed to adjust to room temperature prior to use.

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Battery LifeTester™

ELK-BLT

The **ELK-BLT *Battery LifeTester*** is a compact, easy to use instrument for testing rechargeable 12 Volt batteries up to 65 Amp Hours. Unlike ordinary testers which only measure static criteria, the ***LifeTester*** measures internal conductivity, which is the best indicator of a battery's health and life expectancy. The conductivity value, expressed in Mhos (the inverse of resistance, or Ohms), is compared with an adjustable Mhos Reference Setting stored in the ***LifeTester***. Every battery type has a characteristic Mhos value when it is brand new and fully charged. The test results are displayed as a percentage of the Mhos reference setting. If the results are below 70% the battery should be replaced.

A Battery Reference Chart on page 5 contains data for a sampling of batteries. Space has also been provided for additional battery data to be added.

The ***LifeTester*** is powered by the battery under test and automatically warns if the battery voltage is too low to properly test the battery.

OPERATING INSTRUCTIONS

1. Disconnect the battery from its equipment.

2. Connect the BLACK test lead to the Negative (-) terminal, and the RED to the Positive (+).

The Red "Reversed Battery Leads" indicator will light if the leads are accidentally reversed. The ***LifeTester*** is reverse polarity protected.

3. The first display will show [**8.8.8.**] for 3/4 of a seconds to check the display elements.

4. Next to display will be the ***Mhos Reference Setting,*** alternating with [**rEF**]. This must be correct for the battery you are testing. To adjust the setting refer to **ADJUSTING THE REFERENCE SETTING** on page 3 and the **Battery Reference Chart** on Pg 5.

5. If the ***Mhos Reference Setting*** is correct, press the Green **TEST** button to begin the test. If no other buttons are pressed for 5 seconds the test will begin automatically.

6. Record the ***Battery Voltage,*** which is displayed for the next 1.5 seconds. If the battery voltage is below 12.3 volts, the test will stop and the battery voltage will alternately display with [**Err**], indicating that the battery voltage is too low for the test to continue.

A new battery, out of the box, will generally read around 12.6 Volts. A fully-charged battery will read between 12.6 Volts and 13.5 Volts.

7. Record the ***Ambient Temperature,*** which is displayed in Fahrenheit (F) or Celsius (C). Refer to **SELECTING FAHRENHEIT VS. CELSIUS**.

8. The next display will be [**- - -**], indicating the test calculations are underway. Over the next 10 seconds the ***LifeTester*** will measure the internal conductance of the battery, compensate for the ambient temperature, then calculate and display the results as a percentage % relative to the ***Mhos Reference Setting***.

If the display reads [**Err**], the test lead connections are intermittent and should be reconnected.

9. Record the ***Percent of Reference*** test results. If the results are below 85% the battery is weak and will need to be replaced soon. If the results are below 70% the display will flash **Lo** indicating the battery is too low for reliable operation and should be replaced immediately.

9b. To view the true Mhos value (non-temperature compensated), press and hold the Red button. When Mhos is being displayed the far right decimal point will be lighted. Once the button is released, the ***Percent of Reference*** results will re-display.

Results as Temperature Compensated Mhos

To see the results as temperature compensated Mhos in place of the ***Percentage Of Reference,*** set the ***Mhos Reference Value*** to zero (0). See **ADJUSTING THE REFERENCE SETTING** on page 3.

ADJUSTING THE REFERENCE SETTING

Consult the **Battery Reference Chart** on page 5 for the proper reference setting for your battery.

After initial connection (power-up) and while the Mhos reference value is still being displayed press the Red **ADJUST** button once. To increase the reference setting press the Green (Up) button. To decrease the setting press the Red (Down) button. Holding either button will make the value jump by a value of 10. Release the button when the proper value is displayed. If necessary, fine adjust the value by momentarily pressing either button. Disconnect and reconnect a test lead or wait 10 seconds before resuming at step 4.

SELECTING FAHRENHEIT VS. CELCIUS

To display the common temperature units for your locale, it may be necessary to switch the temperature display from degrees Fahrenheit (F) to Celsius (C) or Celsius (C) to Fahrenheit (F). When the battery test has finished, press and hold the Red Button (Adjust) for two (2) seconds, then also press the Green Button (Test). The new temperature units will be displayed and the ***LifeTester*** will use the new units until the temperature display mode is changed again.

RESTARTING THE BATTERY TEST

To quickly restart a battery test without disconnecting the test leads, press the Green Button (Test) while the ***Percentage Of Reference*** or the ***Temperature Compensated Mhos*** is displayed. The test will be restarted at Step 6.

AUTOMATIC SHUTDOWN

If the ***LifeTester*** is left connected to a battery for more than 30 seconds after the test is complete, it will automatically shutdown to conserve battery power. Disconnecting and reconnecting a test lead will restart the test procedure.

RECORDING BATTERY READINGS

LifeTester measurements should be taken and recorded periodically. The popular method is to record the information onto self-adhesive labels placed directly onto the battery. A supply of these labels is included with the tester. Additional labels may be ordered in packs of 100 by specifying part number ELK-BLT LABELS. This information will be valuable in future tests for trending analysis. The recorded data should include:

A. The ***Mhos Reference Setting*** appropriate for the battery. See **Battery Reference Chart** on page 5.
B. The **Date** of the test.
C. The ***Battery Voltage*** reading. (optional)
D. The ***Ambient Temperature*** reading. (optional)
E. The ***Percentage of Reference*** results.

A new "fresh out of the box" battery that has not been charged should have a Mhos value within 90% of the ***Charged, Full Capacity Mhos*** value from the **Battery Reference Chart**. If the reading is less than 90%, charge the battery for at least 24 hours and then retest.

Battery performance degrades over time due to use and abuse, and may be impacted by many factors like depth and frequency of discharge.

The higher the Mhos value the more current the battery can deliver. Therefore, a new 7 amp-hour battery will have a higher Mhos value than a new 4 amp-hour battery of the similar construction.

MHOS REFERENCE CHART FOR FULLY CHARGED 12V BATTERIES

Battery Ah Capacity	Mhos **rEF**erence	Battery Ah Capacity	Mhos **rEF**erence
0.8 Ah	28		
1.2 Ah	38		
1.3 Ah	40		
2.2 Ah	58		
2.3 Ah	60		
2.6 Ah	66		
3.0 Ah	75		
3.3 Ah	80		
4.0 Ah	95		
4.5 Ah	110		
5.0 Ah	125		
7.0 Ah	200		
7.5 Ah	220		
8.0 Ah	245		
10.0 Ah	275		
12.0 Ah	300		
17.0 Ah	400		
18.0 Ah	425		
24.0 Ah	470		
25.0 Ah	475		
26.0 Ah	480		

These Mhos **rEF**erence values are a benchmark average, created from fresh samples of major brand batteries. If you find consistent, minor variations in readings from multiple samples of a battery, it's likely due to manufacturing differences. However, if the readings are excessively low, the battery is not as good as the benchmark average. If this chart does not include the Ah of a battery you are testing, it may be necessary to generate the values using the procedure "Adding to the Battery Reference Chart" on page 8 of the manual. ELK Products is not responsible for misprints or errors.