

ELK-BLT Battery LifeTester

a.k.a Battery Mhos Meter ver 3.0

Application

The ELK-BLT Battery Life Tester or “Mhos Meter” is a compact, easy to use service tool for testing 12 Volt rechargeable batteries. The **BLT** measures internal conductivity (Mhos), which is the best indicator of a battery’s health and life expectancy. Mhos happens to be the inverse of Ohms (conductance as opposed to resistance). The BLT operates as follows: For each battery brand and size installed you should start by measuring and recording a “baseline” Mhos reading. Then, during any service call or inspection simply measure and record the current (most recent) Mhos reading. Always compare the current Mhos reading with the original reading. Self-adhesive test data labels may be used for recording each inspection. When the current Mhos reading has reached at or around 71% of the original baseline then it is time to consider changing the battery. The **BLT** includes a reference chart on the back with numbers equating to Mhos readings for common security industry battery sizes.

The **BLT** receives its operating power from the battery under test and automatically warns when the battery voltage is too low for testing.



Features

- Does not discharge or damage the battery.
- Tests 12 Volt Rechargeable Batteries.
- Display Shows Battery Voltage and Mhos.
- Warns if battery voltage is too low.
- Replaceable test leads.
- Includes padded carrying case.
- Includes self-adhesive test data labels. **
- Lifetime Limited Warranty.

Specifications

- Operating Voltage: 10.0V - 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.

** To reorder a pack of 100 test data labels specify: **ELK-BLT LABELS**.

BLT 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 **Date** of the test.
 - B. The **Battery Voltage** reading. (optional)
 - C. The **Mhos** reading.
1. Disconnect the battery from it's equipment.
 2. Connect the BLACK test clip to the Negative (-) battery terminal, and the RED to the Positive (+) terminal. (For accurate readings, the test clips must be tightly clipped directly to the battery posts, **not to the battery bolts**).

“Err” or blank indicates battery voltage is too low for testing or a test clip connection is loose.
Try charging the battery or reconnecting the test clips.
 3. The Voltage of the Battery will display briefly. A new battery, out of the box, will generally read around 12.6 Volts. A fully-charged battery should read between 12.6 Volts and 13.5 Volts.

“---” indicates test in process, please wait.
 4. The Mhos (internal conductance) reading of the battery will display within 6 seconds.

ON NEW INSTALLATIONS:

- 4a. Record the Mhos reading and the date of test on the test data labels or on the battery housing using a permanent marker.

ON SERVICE CALLS OR INSPECTIONS:

- 4b. Compare the latest current Mhos reading to the original baseline Mhos reading previously recorded. Then calculate the percentage difference between the baseline and the current Mhos reading (the decline). If the Mhos has declined to 71% or lower from the baseline Mhos reading the battery should be replaced. NOTE: If a calculator is not convenient then use the Battery Mhos Reference Chart on the back of the BLT to locate the value closest to the baseline recorded on this battery. The middle and right hand columns represent the value at 81% (weak) and 71% (replace) respectively.

E.G. Baseline - 180 Mhos Weak - 180 Mhos X .81 = 145.8 Mhos Replace - 180 Mhos X .71 = 127.8 Mhos

NOTE: No standard Mhos values exist for any battery size or brand. In some cases, different production batches of the same brand battery will produce different readings. RARELY will any “similarly rated” batteries from different manufacturers have the same baseline. Therefore, to accurately judge the remaining life of a battery it is absolutely critical to have a recorded baseline for each battery that you use.

The **Battery Mhos Reference Chart** chart on the back of the BLT displays numbers equating to Mhos readings for common security industry battery sizes. It is also based on a battery's ambient temperature being at 72 degrees fahrenheit. This temperature assumption covers many environmental situations, including cold basements or unoccupied buildings, since the battery will be kept warm by the recharging and by being inside the electronics enclosure. However, because cooler temperatures can significantly lower the Mhos reading of a battery, this instruction manual has a more extensive Mhos chart with columns for evaluating batteries that are being adversely affected by 62F, 52F, and 42F degree environments. Also see How Temperature affects a Battery

Automatic Shutdown

If the **BLT** 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.

How Temperature affects a Battery

Generally speaking, temperatures below 72F degrees tend to slow down a battery's internal activity, causing a significant decrease in the Mhos (conductivity) reading as the temperature falls. Therefore, cool temperatures (not below freezing) will tend to prolong a battery's life. Temperatures above 72F cause a battery's internal activity to accelerate, but with only a slight increase in the Mhos reading. Warm temperatures will tend to dry out and degrade a battery much faster than normal.

72 F degrees = 0% no adjustment

62 F degrees = 92% (8% degrade) of normal Mhos

52 F degrees = 87% (13% degrade) of normal Mhos

42 F degrees = 82% (18% degrade) of normal Mhos

Battery Mhos Chart for various Temperature Environments

72 Degree F Environment
Ideal Conditions

Baseline Mhos	81% Mhos Weak	71% Mhos Replace
20	16	14
25	20	18
30	24	21
40	32	28
50	41	36
60	49	43
70	57	50
80	65	57
90	73	64
100	81	71
125	101	89
150	122	107
175	142	124
200	162	142
225	182	160
250	203	178
275	223	195
300	243	213
350	284	249
400	324	284
450	365	320
500	405	355

62 Degree F Environment
-8% degrade

Baseline Mhos	81% Mhos Weak	71% Mhos Replace
20	15	13
25	19	16
30	22	20
40	30	26
50	37	33
60	45	39
70	52	46
80	60	52
90	67	59
100	75	65
125	93	82
150	112	98
175	130	114
200	149	131
225	168	147
250	186	163
275	205	180
300	224	196
350	261	229
400	298	261
450	335	294
500	373	327

52 Degree F Environment
-13% degrade

Baseline Mhos	81% Mhos Weak	71% Mhos Replace
20	14	12
25	18	15
30	21	19
40	28	25
50	35	31
60	42	37
70	49	43
80	56	49
90	63	56
100	70	62
125	88	77
150	106	93
175	123	108
200	141	124
225	159	139
250	176	154
275	194	170
300	211	185
350	247	216
400	282	247
450	317	278
500	352	309

42 Degree F Environment
-18% degrade

Baseline Mhos	81% Mhos Weak	71% Mhos Replace
20	13	12
25	17	15
30	20	17
40	27	23
50	33	29
60	40	35
70	46	41
80	53	47
90	60	52
100	66	58
125	83	73
150	100	87
175	116	102
200	133	116
225	149	131
250	166	146
275	183	160
300	199	175
350	232	204
400	266	233
450	299	262
500	332	291

ELK Products is not responsible for misprints or errors. The Mhos baseline values are benchmarks created from fresh samples of batteries. Be aware that if you find consistent, minor variations in readings from multiple samples of a battery, it's likely due to manufacturing differences.

Recording Battery Readings

The baseline Mhos reading of a new "fresh out of the box" battery may not be as high as the same battery after it has been sitting on charge for at least 24 hours. If the reading is considerably lower than what you would expect then try charging the battery for at least 24 hours, 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.

Generating an Average Baseline

Start with 2 or 3 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 Mhos reading of each one. Average the readings together. This will be the baseline number that you can use for estimating battery decline. However, there is no substitute or shortcut that can match the accuracy of actually measuring a baseline for each individual installed battery.

Accumulating Trend Analysis over a Period of Years

Trending of periodic Mhos measurements can yield valuable insights for estimating the remaining life of the battery. Suppose that a battery has been in service for three years, and that the **BLT** measurements after the first year was 90 Mhos, 85 Mhos after the second year, and 80 Mhos after the third year. Since the battery is still at 80 Mhos and is dropping an average of 5 Mhos per year, it is highly likely that this battery will not need replacing before the end of the fourth year. On the other hand, suppose that the readings were 90 Mhos after the first year, 82 Mhos after the second year, and 70 Mhos after the third year. The rate of decay has increased from 8 Mhos to 12 Mhos 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 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.

Why Mhos instead of Amp Hour

The **BLT** measures the Mhos (conductance) 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 Mhos (conductance) values, 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-hour 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 71% of its full-capacity reference, the battery is unlikely to deliver its rated capacity and should be replaced.

Is Mhos relational to Cold Cranking Amps?

No, the **BLT** is designed to measure the conductance of a battery at frequencies indicative of the capacity of a battery in Amp-hour. 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 **BLT**, 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.

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 later 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. At this point in its service life the battery Mhos reading has generally reached a point of 71% or lower of its original baseline reading. The battery should therefore be replaced since it is no longer considered serviceable.