# EAGLE EYE TECHNICAL NOTE

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| **Title** | **Reconciling Battery Ohmic Data from Multiple Equipment Vendors** |
| **Document No.** | **TN-032720-1** |

## Revision History

| Date | Revision | Change Description | Author(s) |
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| 3/27/20 | 0 | Initial issue | GP |
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## Overview

As companies transition from calendar-based battery maintenance to real time battery monitoring or to a new portable monitor vendor, the challenge is to reconcile the historical data with the new solution, this is particularly true for the cell/unit ohmic data.

The measurement of the ohmic value can be made using either AC or DC signal as the perturbation method and depending on the method used the value. will be reported as a Impedance, Resistance, or Conductance If the new monitoring equipment uses a different perturbation method from the old, that can be a challenge as the values reported for the same cell or unit will be different between the new and historic data. Even when the methodology used is the same, if the level and frequency of the perturbation signal is not identical the value reported will be different.

Because the differing values make it difficult to evaluate the batteries condition on an ongoing basis, a typical request from the user is to ask the new equipment vendor to provide a correction factor to bring the new readings closer to the values that had been collected in the past. This may seem to be a logical solution, but there are too many variables including the operating environment to ensure an accurate conversion for every reading. There is however a better way.

## Value of Ohmic Testing

The primary reason we measure and collect the ohmic value of the cells or units within a Lead Acid Battery is because as the battery ages the ohmic value changes due to the increased level of corrosion within the battery. Although an increase in the ohmic value does not directly equate to a loss of capacity it is a proven indication as to the battery’s state of health.

Each cell or unit when manufactured and fully charged should have a similar response to the perturbation signal used for the ohmic test. Over the life of that battery, ideally each of the cells or units will age at a similar rate and the average ohmic value of the string will change until it reaches a value that will indicate the battery may be reaching end of life and require further evaluation. That percentage change in ohmic value at which the battery will require further evaluation is dependent on whether the battery is a Vented Lead-Acid (VLA) or Valve-Regulated Lead-Acid (VRLA) design and is a single cell or a multi cell unit. This can be set by the user.

Unfortunately, history has shown that many installed batteries never achieve their projected life. The failure of any individual cell will impact the life of the battery. While there are the many possible reasons for a cells failure, almost all will result in a changed response to the perturbation signal when compared to the other cells in the battery. Unlike the level of change in the battery’s average impedance where an alarm limit can bet set. For a failing cell there is no preset level of ohmic value, at which action is required. Any cell or unit in which the ohmic value is deviating from the other cells or units in the string has the potential to fail and typically the rate at which the change is occurring will indicate the urgency at which the cell or unit requires further analysis and possible replacement.

As can be seen, whether it is estimating the point at which a battery may require replacement or identifying the potential for a cell failure using the ohmic values. The basis for that analysis is the change in ohmic value over time and, if shown as a percentage change, the value irrespective of the methodology used and the range of numeric values being reported, the percentage change should be a consistent value.

## Problems with Ohmic Testing

The problem we have is that historically both in the manufacturers proprietary analysis software and where the data has been integrated into other maintenance reporting systems. The actual percentage rise is seldom reported as a value but is used to establish the alarm limits for the graph of the measured ohmic values and based on the user determined alarm limits which in turn are dependent on battery type and construction. These alarm settings will typically be set at the value that will identify the point at which the battery is approaching end of life. But these alarm limits do not indicate when an individual cell or unit should be changed as noted earlier.

## What is the Solution?

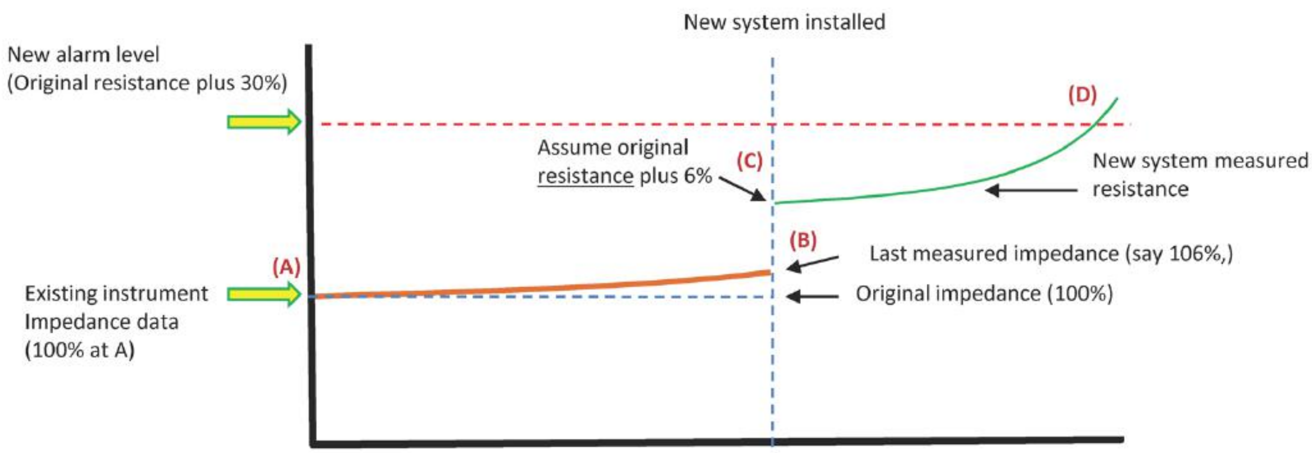
Based on all the above how do we integrate and reconcile the data as accurately as possible? The answer is to determine the current percentage ohmic change recorded by the old system and use that to establish the alarm limits for the new system. The method to achieve that is going to be dependent on how the existing alarm points are configured.

On the systems where the baseline is a single value based on the average of all the initial ohmic values in the battery string and all the latest individual ohmic values measurements are still within the same original percentage differential range, the average change in ohmic value since monitoring started can be calculated. This value when subtracted from the allowable percentage change of the original alarm setting will determine the percentage change remaining. The baseline for the new system will then be established using the first set of stable readings and the previously calculated remaining percentage change value can now be used as the alarm setting to maintain the integrity of the end of life alarm point.

For those systems where the percentage change is calculated on an individual cell or unit basis a little more work is required. The percentage change for each existing measurement point must be calculated. Then using the first set of stable readings in the new system an original baseline figure can be calculated using the percentage change recorded for each measurement in the existing system. This new calculated baseline can be installed in the new monitor and all future reports will include the previously recorded percentage change in ohmic value.

As with everything involved with a battery monitoring system the integration of the data within the maintenance protocol of the user's company will be no different. The basic principles outlined above are a starting point and will be the subject of consultation with the vendor to ensure an accurate integration of data is achieved.

To Compare a New Resistance System with Existing Impedance Data




To compare a new resistance system with existing impedance data

1. Note the latest impedance measurement (B)
2. Note the impedance measurement on installation (A)
3. Calculate the percentage of B over A = (say 6% increase)
4. Note the resistance value on installation of new system (C)
5. Subtract answer from (3), (6%) from the new resistance reading (4) to give the original resistance
6. Add 30% to the result in (5), this will give the new resistance alarm level to set. (D)

Note: No two impedance instruments from different manufacturers will ever give the same reading, as every manufacturer uses different frequencies, measurement methods, circuits & components.