



Calibration vs. Verification

By Tim Cooke

Introduction

"If you aren't adjusting the device being tested, aren't you just doing a verification?"

Before you Metrologists out there come after me with pitchforks, admit it...you've heard it before. It's a truly cringe-worthy statement to those in the profession. But to a typical user of test and measurement equipment, it is probably a more common misconception than we'd like to admit.

So how can we define the difference between calibration and verification?

Verification

Merriam-Webster lists a definition of verification as: "the act or process of confirming or checking the accuracy of: the state of being confirmed or having the accuracy checked."

Well, that sounds an awful lot like a calibration. "Ouch!", proclaims the Metrologist!

So, using this definition, how can a verification be interpreted or performed? Conceivably, it could be the comparison of identical units without consideration of manufacturer's specification and without measurement traceability to a known national standard such as NIST (National Institute of Standards and Technology).

At this point, the two pieces of equipment may agree with one another, but that does not mean they agree with reality. And certainly, the user has no assurance that the equipment is performing to the manufacturer's tolerances.

Calibration

Dictionary back in hand, *Merriam-Webster* lists a definition of calibration as "to measure precisely" and "especially: to measure against a standard."

To a Metrologist, the last five words in that definition allows an "aha moment". To measure against a standard!

Industry Definitions

So, this is where we should throw out the damn dictionary. Why? Because industry does not march to Merriam-Webster. Industry is held to a higher norm.

The internationally excepted (ISO, ILAC, etc.) reference for metrology definitions is JCGM document 200:2012, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*.

The VIM states calibration is an, “operation that, under specified conditions, in a first step, establishes a relation between the **quantity values** with **measurement uncertainties** provided by **measurement standards** and corresponding **indications** with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a **measurement result** from an indication.”

More simply stated, it is a quantified comparison between a known and an unknown.

Adjustment

The VIM also states “Calibration should not be confused with **adjustment of a measuring system**, often mistakenly called “self-calibration”, nor with **verification** of calibration.”

Easy for them to say...

But some of the most precise calibrations are those undertaken for items like gage blocks. They are very tight tolerance calibrations, but there is no adjustment possible for such items.

For an item that can be adjusted, the process of calibration may uncover the need for such action, but adjustment is not part of the formal definition. Comprehensive as-found values should be recorded prior to adjustments of any kind.

Summary

The table below provides a side-by-side of some of the primary concepts:

Verification:	Calibration:
Could be comparison of like units.	Comparison to a standard with known uncertainties.
Traceability undefined.	Traceable to national standards via an unbroken chain.
Undefined procedures and process	Validated procedures and accredited process
Undefined environmental restrictions and conditions.	Ambient conditions monitored and recorded.

When is a verification enough? That depends on the application. But if you need more than a verification, contact an ISO/IEC 17025 Accredited calibration provider.

References:

International vocabulary of metrology – Basic and general concepts and associated terms, Third Edition, 200:2012

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