Calibration Interval Analysis Frequently Asked Questions

Integrated Sciences Group answers frequently asked questions relating to calibration interval analysis. The answers are intended to provide clarification and dispel common misconceptions. If you have any questions or comments regarding any of our calibration interval analysis FAQ topics or would like us to answer additional questions, please contact us at tech@isgmax.com.

Question	Answer
Why do measuring and test equipment (MTE) need to be calibrated on a regular basis?	MTE are periodically calibrated to determine if their attributes and parameters are performing within manufacturer specified tolerance limits. Periodic calibration of MTE parameters and attributes provides a major safeguard in controlling uncertainty growth and reducing the risk of substandard performance during use.
What is uncertainty growth and why is it important?	Over time, the error or bias in an MTE attribute or parameter may increase, remain constant or decrease. The uncertainty in this error, however, always increases with time since measurement or calibration. Uncertainty growth over time corresponds to an increase in out-of-tolerance probability over time, or equivalently, to a decrease in in-tolerance probability or "measurement reliability" over time.
What is measurement reliability?	In-tolerance probability, usually expressed as a function of time elapsed since calibration.
What are AOP, BOP and EOP reliability?	Average-over-period (AOP) reliability is the in-tolerance probability for an equipment parameter averaged over its calibration interval. Beginning-of-period (BOP) reliability is the in-tolerance probability for a parameter at the beginning of its calibration interval. End-of-period (EOP) reliability is the in-tolerance probability for a parameter at the end of its calibration interval.
What is the goal of calibration interval analysis?	To establish or adjust calibration intervals to ensure an acceptable in-tolerance probability for MTE parameters or attributes during use.
Is the purpose of a calibration interval to prevent out-of-tolerances from occurring?	No. The purpose of a calibration interval is to ensure that items in use have an acceptable in-tolerance probability.

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Do MTE users know when out-of-tolerances occur?	The evidence suggests that experienced users become aware of out-of-tolerances when parameter values exceed specs by a factor of about three to four.
Are calibration intervals only determined by the using activity?	Calibration intervals can be determined by any activity that has access to the calibration history data and the capability to perform the analysis. However, the using activity's familiarity with its MTE inventory and servicing policies are required to ensure optimal intervals.
What methods should be used to adjust calibration intervals?	The only known validated methods for adjusting calibration intervals to meet reliability targets are those that employ mathematical models to describe the uncertainty growth process. These models are referred to as reliability models. The basic approach is called reliability modeling.
What are reliability models?	Reliability models are mathematical functions used to model a particular out-of-tolerance mechanism. There are currently eight functions used: exponential, weibull, mixed exponential, random walk, restricted random walk, modified gamma, mortality drift and warranty.
What is reliability modeling?	With reliability modeling methodologies, mathematical models of uncertainty growth mechanisms are employed to predict when the measurement reliability of an item will fall to a value equal to the desired reliability target.
How do I establish a reliability target?	Your reliability target should correspond to the maximum acceptable false-accept risk requirement.
Are interval adjustments based on simple reactive algorithms valid?	With reactive methods, intervals are lengthened or shortened in response to the results of recent calibrations. Such methods have been shown to be ineffective. Interval adjustments need to be based on sufficient calibration history data and made to achieve appropriate reliability targets.
Can the exponential model be applied to all MTE?	No. A variety of reliability models is needed to model the behavior of MTE in most inventories.