Uncertainty Analyzer 3.0 Update 150215

Several changes to Version 3.0 were made since the last printing of the User Manual. The changes made up to and including Update 150215 are described below.

Data Entry Worksheet

The **Outliers** option in the **Tools menu** has been removed. It has been replaced by six options now located in a new **Outliers menu**.

Menu Options

The following options are listed in the Outliers menu.

Remove

Selecting this option removes outliers from the Measurement Results table.

Restore

Selecting this option restores outliers that have been removed from the Measurement Results table by selecting the Remove option. The Remove option is disabled if data are added or subtracted from the table following selection of the Remove option.

Highlight

Selecting this option highlights outliers in the Measurement Results table. Highlighted entries appear in red type face.

Undo Highlight

Selecting this option cancels highlighting outliers in the Measurement Results table.

Exclude

Selecting this option excludes outliers from the data sample without removing them from the Measurement Results table.

Include

Selecting this option includes outliers in the Measurement Results table in the data sample.

Availability

Options are enabled or disabled according to the existence and display status of outliers in the data sample.

Normality Testing

An error trap has been added to the normality test that prevents overflow errors when testing large samples.

Item Update and Parameter Update Worksheets

Warning messages have been added to the **Instrumentation Database Update** and **Delete** actions.

Reliability Model Worksheets

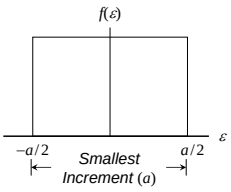
The **Compute Coefficients** and **Compute % In-Tolerance** functions now require clicking the compute buttons. Previously, all that was required was exiting any of the text entry boxes. The change was made to prevent premature spurious calculations that caused error messages.

Parameter Resolution Error Worksheets

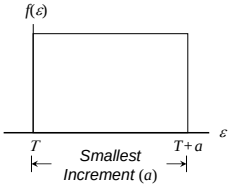
An option has been added to treat digital resolution as a truncation error, in addition to a round-off error.

Round-Off Error

This is the option that has been available since the inception of UncertaintyAnalyzer. It treats the resolution error ε as lying within ± half the smallest increment with uniform probability, as shown in the adjoining figure. If the smallest increment is labeled a, then the uncertainty due to digital resolution is



$$u = \frac{a/2}{\sqrt{3}} .$$



Truncation Error

Imagine looking at a digital clock whose readout is 12:10 PM. Assuming a perfectly accurate clock, the readout will display 12:11 PM one minute after 12:10 PM. If the clock currently displays 12:10 PM, we don't know how close we are to 12:11 PM, only that the correct time is between 12:10 and 12:11 PM, i.e., somewhere within a one-minute interval.

The Truncation Error option is a new option that applies to such things as digital clocks, in which the resolution error is not contained within ± half the smallest increment of resolution but within the full increment. For this option, the uncertainty due to digital resolution is

$$u = \frac{a}{\sqrt{3}} ,$$

where ,again, a is the smallest increment of resolution.

Bug Fix

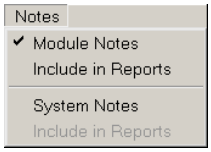
In Update 100915, a bug was fixed in which the resolution increments for parameters retrieved from the Instrumentation Database were not being implemented in the Resolution Error Worksheet.

Notes Flag

* Notes * A flag has been added to the menus of various screens and worksheets to indicate that notes are present for the error source. In cases where the “Notes” option is available from the menu bar of the screen or worksheet, the flag consists of two asterisks, one on each side of the “Notes” menu bar option. For the System Model Screen and the System GUI Screen, the flag consists of a check mark on the Notes submenu.

Include Notes Option

The option has been added to include the notes for an error source in the analysis report for the source. This option is available from various screens and worksheets throughout UncertaintyAnalyzer.

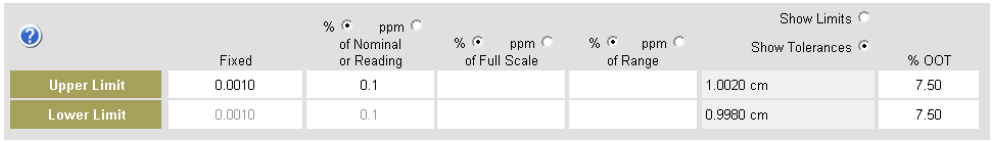


Tooltip Caption Change

The tooltips "Update Module" and "Select Module" on the **System Model** and **System GUI** screens have been changed to "Update Module Database" and "Select Module from Database," respectively.

Show Tolerances Option

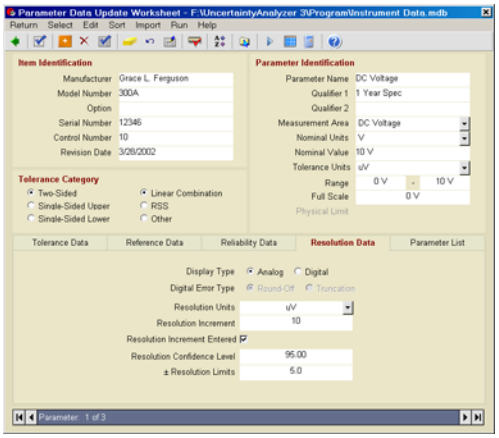
A **Show Tolerances** option has been added to the **Bias Uncertainty Worksheet** to display Tolerances as well as Tolerance limits for the **Toleranced Parameter** Specification Option. The Show Limits and Show Tolerances options work in conjunction with the **Display Units** options.



Parameter Data Update Worksheet

A **Resolution Increment Entered** check box has been added to the Resolution Data tab of the **Parameter Data Update Worksheet**. This enables setting and retrieving a flag in the Instrumentation Database indicating that the resolution limits are to be calculated from the resolution increment for parameters with analog resolution (this is automatically the case for parameters with digital resolution).

The **Enter Data from Parameter Template** option of the Edit menu has been changed to **Enter Parameter Data from Analysis**.



Bias Distribution Statistics and Plots

Internal procedures for developing bias distribution statistics, such as Parameter Bias, Bias Uncertainty and Distribution Limits, have been overhauled to improve responses to user changes in Percent In-Tolerance and % OOT on the Parameter Bias Uncertainty Worksheets.

Parameter Templates

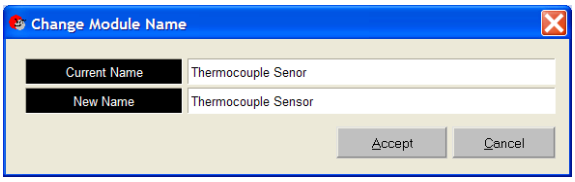
A bug was fixed that prevented retaining user entered item and parameter identification data during navigation between UncertaintyAnalyzer primary screens and during File Save operations.

Analysis Guide Topics

The topic “Using the Error Source Worksheet” was not being opened when selected from the Analysis Guide topics. This problem has been corrected.

Module Name Changes

Names of system modules can now be changed on the **System Model Screen**. Changes are made on the “Change Module Name” form, accessed by selecting **Module Name** from the Edit menu.



System Information

In systems with large memory, a fatal error in opening Help About was found and corrected. Minor cosmetic changes were also made.

Mixed Exponential Reliability Model

A problem was detected and fixed relating to computing the parameters of the mixed exponential model. The form of the model was updated to match that documented in NCSLI RP-1.

Reliability Model Worksheet

The mortality drift reliability model, given by

$$R(t) = e^{-(at+bt^2)}$$

has been replaced with

$$R(t) = ae^{-bt^2}.$$

This form of the model also represents mortality drift behavior and yields more consistent and robust estimates of the a and b parameters. Minor code changes were also made to improve using entered reliability model coefficients to compute BOP, AOP and EOP percentages.

SMPC (Bayesian) Analysis

Modifications were made to improve the computation and reporting of the estimated true value and bias of the Subject Parameter.

Log10 Funtion

The Log10 function was made available as a VBScript math function for user programming in the User Defined, System Analysis and SpecMaster VBScript containers. Formerly, users had to compute this function using Log10(x) = Ln(x)/Ln(10).

Help File

Some existing topics have been updated and new topics added. Some index keys have been added and others renamed. The Table of Contents has been revised.