



Overview of E1733A Calibration Software Operation – r1.09

Introduction

The E1733A Calibration Software is Agilent's latest software for collecting and analyzing position data using the Agilent 5530 measurement system. Note that this system uses all of the same optics as the 5529 system, so all of the optical setups are the same as is described in the manuals and help files for that system and the 10747* software. What follows is an overview of E1733A software and its operation. It should be considered a supplement to the other manuals.

Measurement Selection Screen



Figure 1. Measurement Selection Screen

The above figure shows the main screen that is displayed after starting the E1733A Calibration Software. Note the revision number in the bottom left corner. Please include this information with any requests for assistance or reports of problems encountered. This main screen allows quick selection of the desired measurement (position mouse over selection and left click), language (click on Setup), or a prior measurement data file (click on Open).



Basic Measurement Screen

Figures 2 thru 5 show the setup and measurement screens for Linear measurements. Other measurements selected from the main selection screen have a similar set of screens.

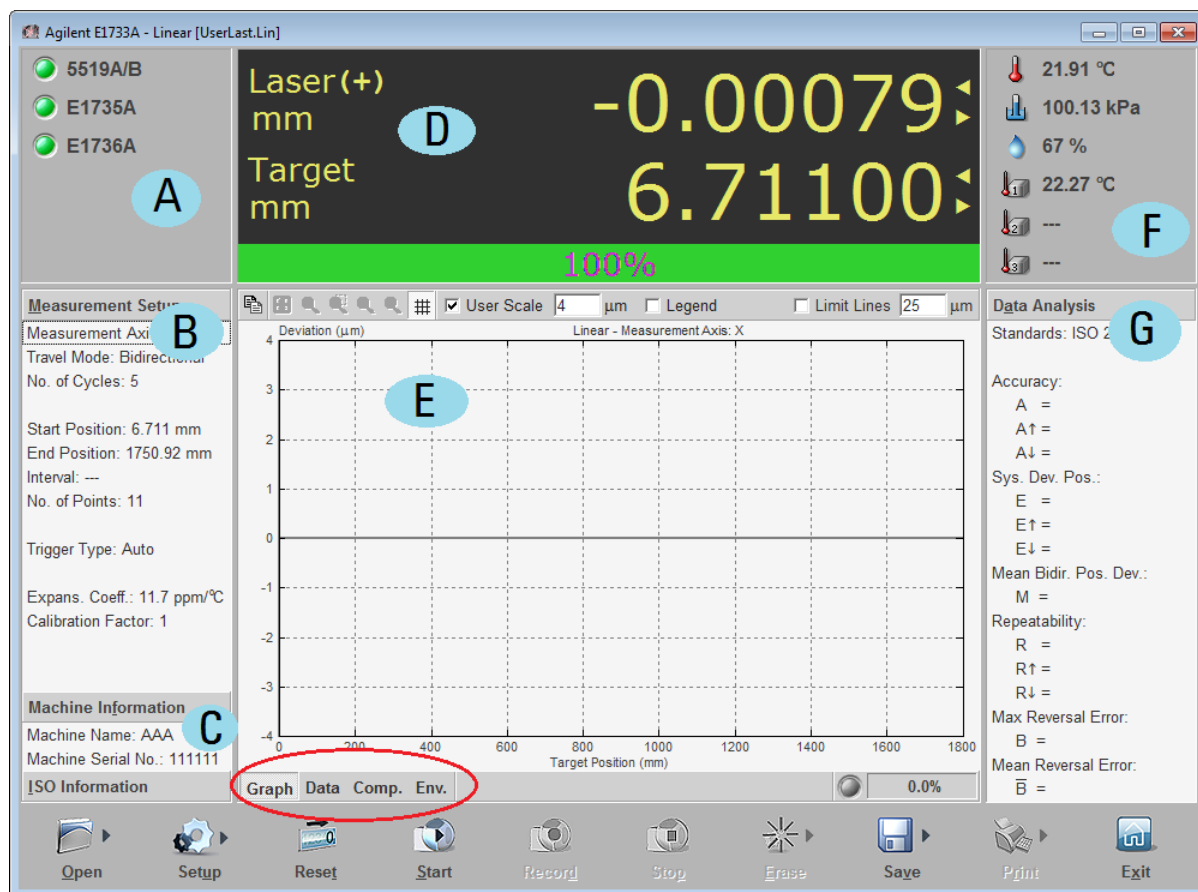


Figure 2. Linear Measurement Screen

Each section of the above figure operates as follows:

- Single clicking any item or double clicking anywhere in this area brings up the System dialog shown on the left of Figure 3.
- Single clicking this area's title bar or double clicking anywhere in this area brings up the Measurement Setup dialog shown in Figure 4.
- Single clicking this area's title bar or double clicking anywhere in this area brings up the Machine Info dialog shown in Figure 6.



- D. The Position Display area has multiple operations, but in general, if the item changes color when the mouse is moved over it, then clicking on the item will perform some function:
 - a. Double clicking in this area makes the Position display occupy the entire window other than the bottom toolbar.
 - b. Clicking the (+) sign changes the laser direction sense and will show as (-) after being clicked.
 - c. Clicking "Laser" changes the display to "Error"
 - d. Clicking "Target" changes the display to "Encoder" (only if the measurement setup is set to Encoder).
 - e. Clicking the arrows to the right of the numbers increases and decreases the number of decimal places displayed for each value.
- E. The Measurement Graph and Data area has multiple operations as follows:
 - a. Double clicking in this area makes the Measurement Graph and Data area occupy the entire window other than the bottom toolbar.
 - b. Clicking the small speed-bar buttons at the top performs some copy and zoom operations.
 - c. Clicking the tabs at the bottom (circled in red) select alternate ways (Graphical, Data Table, Compensation Table, Environmental Data – Statistics, Temp Graph, Pressure Graph, RH Graph, Material Temp Average Graph) to view the collected data.
- F. Single clicking any item or double clicking anywhere in this area brings up the Environmental screen shown on the right of Figure 3.
- G. Single clicking this area's title bar or double clicking anywhere in this area brings up the Data Analysis Setup dialog shown in Figure 5.

Additionally, one can click on the "ISO Information" bar to bring up the dialog shown in Figure 7, and load and save files and start and stop the measurement process by using the toolbar buttons at the bottom of the screen. Note that when saving either the raw data or the compensation table data using the Save button, the file type drop down list allows one to select the sort order (run number or position number) for saving the data,

The bar at the bottom of the screen is designed to guide the user through the steps to making a measurement by following the buttons from left to right.

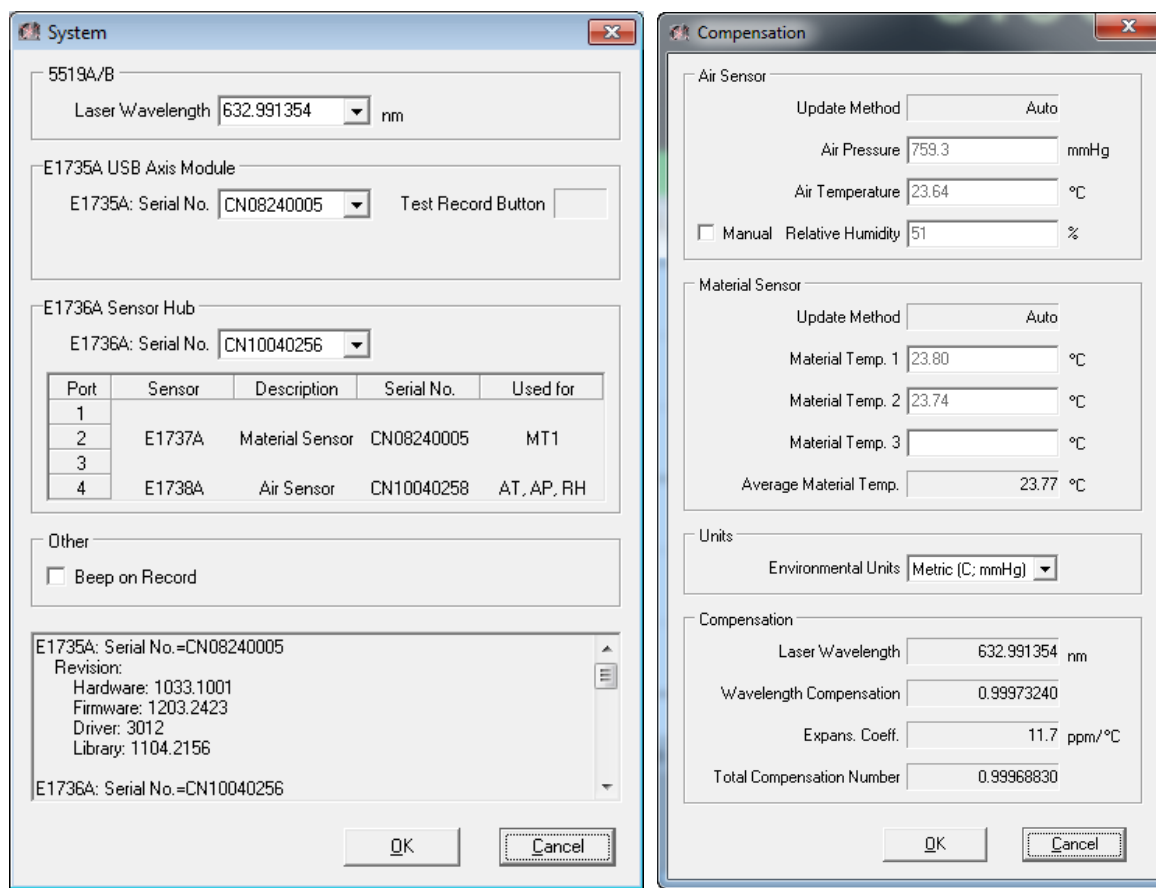
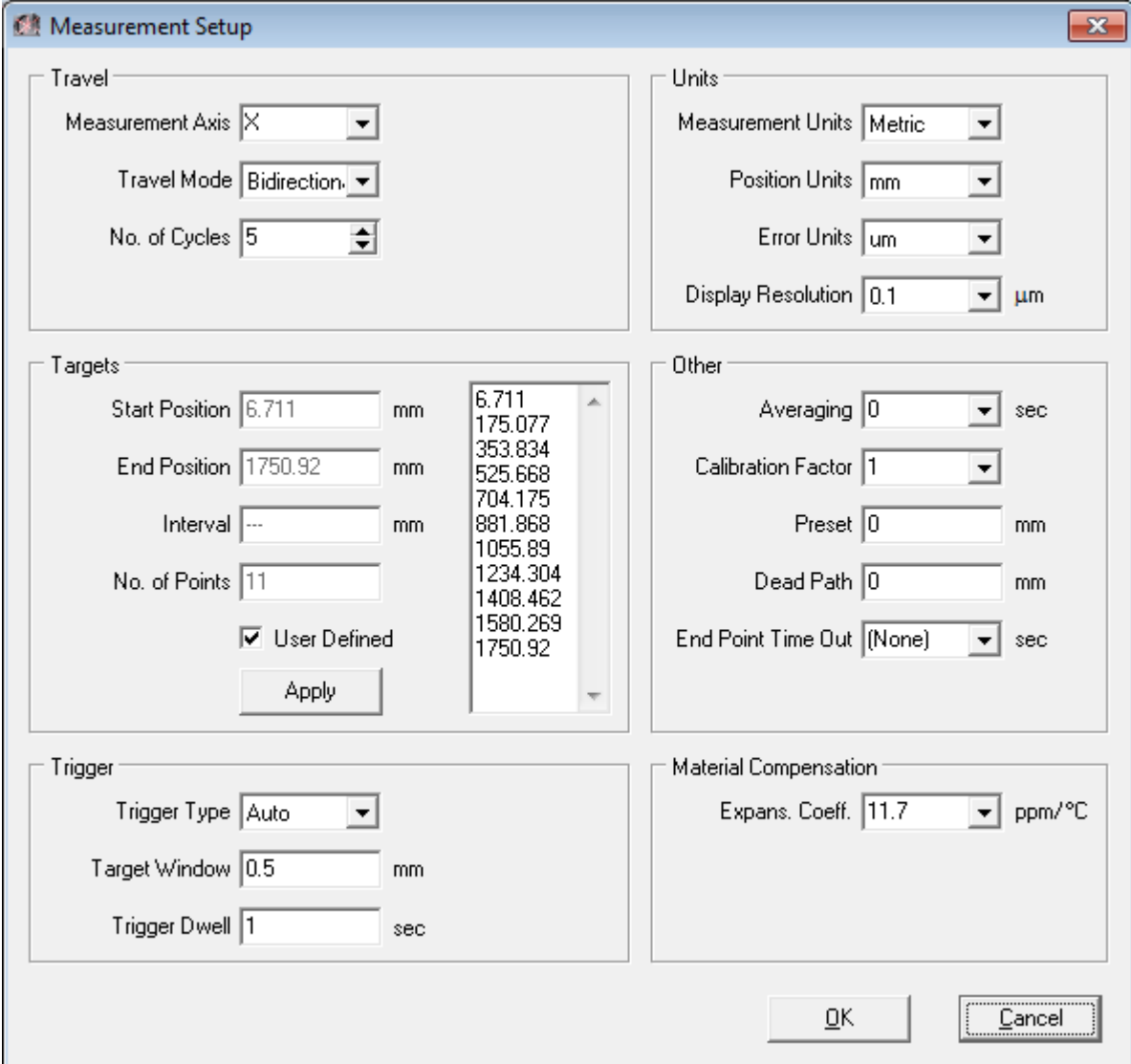


Figure 3. System and Compensation dialogs

The System dialog allows one to view information about the hardware connected to the system and to change the laser wavelength being used by the software. Note that this dialog contains the Beep on Record check box, allowing it to be turned off or on during a measurement without interrupting the measurement.

The Compensation dialog allows one to see (and manually adjust if desired) the current values being used to compensate the measurement for changes to the air density and material temperature.



The Measurement Setup dialog box is divided into several sections for configuring measurement parameters:

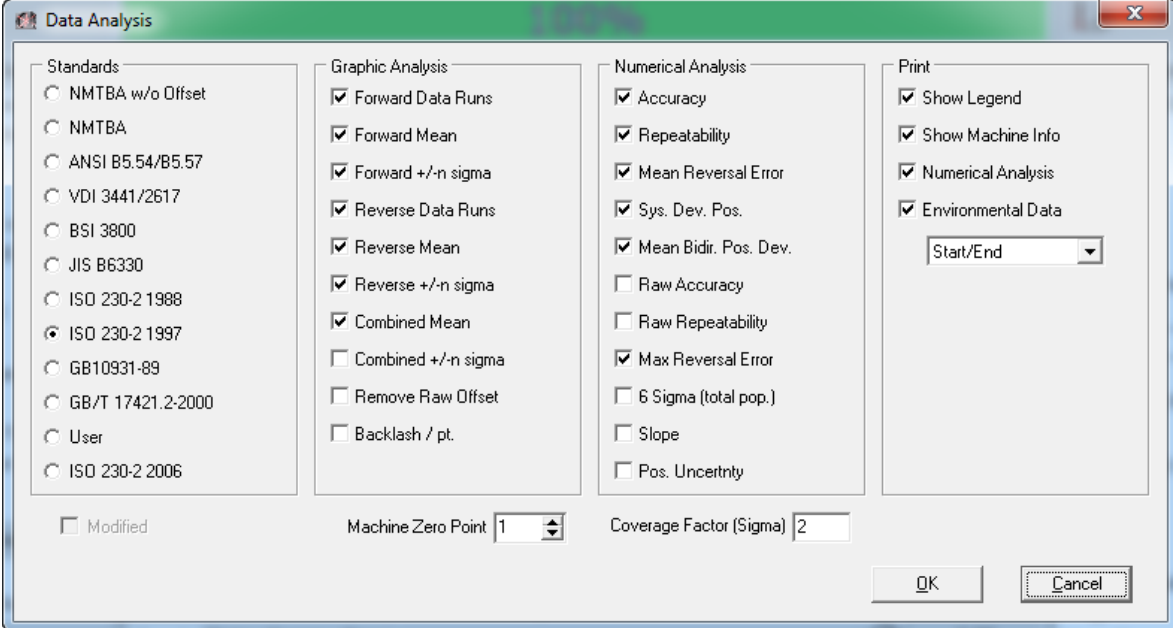
- Travel**:
 - Measurement Axis: X
 - Travel Mode: Bidirection
 - No. of Cycles: 5
- Units**:
 - Measurement Units: Metric
 - Position Units: mm
 - Error Units: μm
 - Display Resolution: 0.1 μm
- Targets**:
 - Start Position: 6.711 mm
 - End Position: 1750.92 mm
 - Interval: --- mm
 - No. of Points: 11
 - ☒ User Defined
 - Apply button
 - Target list: 6.711, 175.077, 353.834, 525.668, 704.175, 881.868, 1055.89, 1234.304, 1408.462, 1580.269, 1750.92
- Other**:
 - Averaging: 0 sec
 - Calibration Factor: 1
 - Preset: 0 mm
 - Dead Path: 0 mm
 - End Point Time Out: (None) sec
- Trigger**:
 - Trigger Type: Auto
 - Target Window: 0.5 mm
 - Trigger Dwell: 1 sec
- Material Compensation**:
 - Expans. Coeff.: 11.7 ppm/ $^{\circ}\text{C}$

Buttons: OK, Cancel

Figure 4. Measurement Setup dialog

The Measurement Setup dialog is used to specify how the measurement will be made. Note that although only X, Y, and Z are listed in the drop down list for Measurement Axis, any letter or designation can be typed into this field, and any changes made will be reflected in the title of the Graph in that section of the display.

Note that it is best to set the Units values before setting any of the Target values.



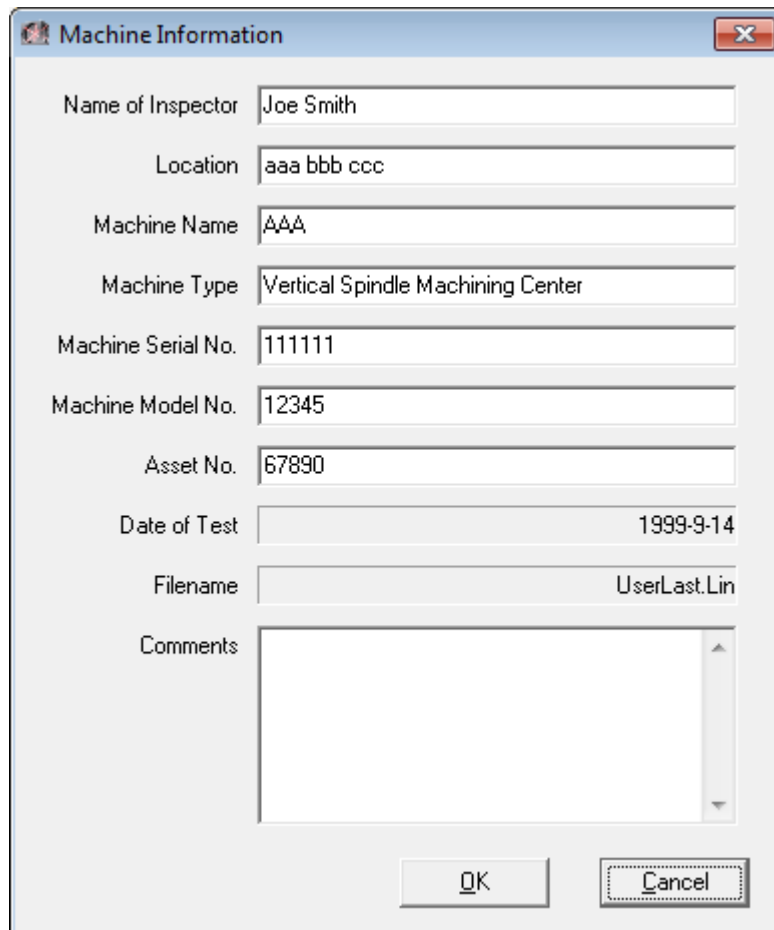
The Data Analysis dialog box is a software window with a green title bar and a standard Windows-style border. It is divided into four main panels. The left panel, titled 'Standards', contains a list of radio buttons for selecting a standard: NMTBA w/o Offset, NMTBA, ANSI B5.54/B5.57, VDI 3441/2617, BSI 3800, JIS B6330, ISO 230-2 1988, ISO 230-2 1997 (which is selected), GB10931-89, GB/T 17421.2-2000, User, and ISO 230-2 2006. Below this list is a checkbox labeled 'Modified'. The middle panel, titled 'Graphic Analysis', contains a list of checkboxes: Forward Data Runs, Forward Mean, Forward +/-n sigma, Reverse Data Runs, Reverse Mean, Reverse +/-n sigma, Combined Mean, Combined +/-n sigma, Remove Raw Offset, and Backlash / pt. The right panel, titled 'Numerical Analysis', contains a list of checkboxes: Accuracy, Repeatability, Mean Reversal Error, Sys. Dev. Pos., Mean Bidir. Pos. Dev., Raw Accuracy, Raw Repeatability, Max Reversal Error, 6 Sigma (total pop.), Slope, and Pos. Uncertainty. The far right panel, titled 'Print', contains a list of checkboxes: Show Legend, Show Machine Info, Numerical Analysis, and Environmental Data, followed by a 'Start/End' dropdown menu. At the bottom of the dialog, there are two input fields: 'Machine Zero Point' with a value of 1 and 'Coverage Factor (Sigma)' with a value of 2. The dialog concludes with 'OK' and 'Cancel' buttons.

Standards	Graphic Analysis	Numerical Analysis	Print
<input type="radio"/> NMTBA w/o Offset	<input checked="" type="checkbox"/> Forward Data Runs	<input checked="" type="checkbox"/> Accuracy	<input checked="" type="checkbox"/> Show Legend
<input type="radio"/> NMTBA	<input checked="" type="checkbox"/> Forward Mean	<input checked="" type="checkbox"/> Repeatability	<input checked="" type="checkbox"/> Show Machine Info
<input type="radio"/> ANSI B5.54/B5.57	<input checked="" type="checkbox"/> Forward +/-n sigma	<input checked="" type="checkbox"/> Mean Reversal Error	<input checked="" type="checkbox"/> Numerical Analysis
<input type="radio"/> VDI 3441/2617	<input checked="" type="checkbox"/> Reverse Data Runs	<input checked="" type="checkbox"/> Sys. Dev. Pos.	<input checked="" type="checkbox"/> Environmental Data
<input type="radio"/> BSI 3800	<input checked="" type="checkbox"/> Reverse Mean	<input checked="" type="checkbox"/> Mean Bidir. Pos. Dev.	Start/End
<input type="radio"/> JIS B6330	<input checked="" type="checkbox"/> Reverse +/-n sigma	<input type="checkbox"/> Raw Accuracy	
<input type="radio"/> ISO 230-2 1988	<input checked="" type="checkbox"/> Combined Mean	<input type="checkbox"/> Raw Repeatability	
<input checked="" type="radio"/> ISO 230-2 1997	<input type="checkbox"/> Combined +/-n sigma	<input checked="" type="checkbox"/> Max Reversal Error	
<input type="radio"/> GB10931-89	<input type="checkbox"/> Remove Raw Offset	<input type="checkbox"/> 6 Sigma (total pop.)	
<input type="radio"/> GB/T 17421.2-2000	<input type="checkbox"/> Backlash / pt.	<input type="checkbox"/> Slope	
<input type="radio"/> User		<input type="checkbox"/> Pos. Uncertainty	
<input type="radio"/> ISO 230-2 2006			

☐ Modified Machine Zero Point: 1 Coverage Factor (Sigma): 2 OK Cancel

Figure 5. Data Analysis dialog

The Data Analysis dialog allows one to specify the standard to use for the analysis, and to optionally customize the selected standard by modifying the resulting settings in the middle and right panels of the dialog.



The image shows a 'Machine Information' dialog box with a title bar containing a close button. The dialog contains several input fields and a text area. The fields are labeled on the left and have their current values on the right. The labels are: 'Name of Inspector', 'Location', 'Machine Name', 'Machine Type', 'Machine Serial No.', 'Machine Model No.', 'Asset No.', 'Date of Test', 'Filename', and 'Comments'. The values are: 'Joe Smith', 'aaa bbb ccc', 'AAA', 'Vertical Spindle Machining Center', '111111', '12345', '67890', '1999-9-14', 'UserLast.Lin', and an empty text area. At the bottom right are 'OK' and 'Cancel' buttons.

Field Label	Value
Name of Inspector	Joe Smith
Location	aaa bbb ccc
Machine Name	AAA
Machine Type	Vertical Spindle Machining Center
Machine Serial No.	111111
Machine Model No.	12345
Asset No.	67890
Date of Test	1999-9-14
Filename	UserLast.Lin
Comments	

Figure 6. Machine Info dialog

The Machine Info dialog allows one to enter any additional information as needed.



ISO Information

Measuring Information		Test Conditions	
Date of Test	1999-9-14	Location (mm)	
Name of Inspector	Joe Smith	Material Sensor #1	table, X=50
Machine Name	AAA	Material Sensor #2	table, X=1700
Machine Type	Vertical Spindle Machining Center	Material Sensor #3	table, X=30
Machine Serial No.	111111	Air Sensor	centre of work zone
Measuring Instrument and Serial No.	BBB,1234567	Compensation Routine	4 sec

Test Parameters		Estimation of Measurement Uncertainty	
Tested Axis	Lead Screw	Measurement Length	100 mm
Type of Scale	ball screw and rotary encoder	Calibrated Measuring Device	<input type="checkbox"/>
NDE Correction (yes or no)	<input checked="" type="checkbox"/>	Error Range	0.8 ppm
Coefficient of Thermal Expansion of Scale	11.7 ppm/°C	Alignment; Assumed	1 mm
Feed Rate	1000 mm/min	Difference to 20°C; Maximum	5 °C
Dwell Time at Each Target Position	5 sec	(Material Sensor) Deviation; Maximum	0.2 °C
Compensation Used	reversal and leadscrew	Uncertainty of Expansion Coefficient	2 ppm/°C
		Environmental Variation	1.7 µm

Test Location	
Position of axes not under test	Y=300 mm; Z=350 mm; C=0
Offset to Tool Reference (X/Y/Z)	0 / 0 / 120 mm
Offset to Workpiece Reference (X/Y/Z)	0 / 0 / 30 mm

OK Cancel

Figure 7. ISO Info dialog

The ISO Information dialog allows one to see and adjust the information used for printing the ISO reports.