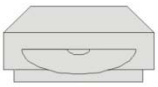
eZ-Balance version 4.2.x

Requires a 32-bit version of Windows®



Windows 2000 SP4
Windows XP
Windows Vista (x86)

Balancing Software for Rotating Machinery

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Reference Note:
If necessary, refer to your specific hardware's user manual for information regarding: Software Installation, System Requirements, Hardware Setup, and Driver Installation.

What is eZ-Balance?

eZ-Balance is a multi-plane balance software package, that will compute the optimal balance weights and weight locations based on vibration data. This data can be collected by ZonicBook/618E, WaveBook/516 Series* and IOtech 600 Series** data acquisition devices. Data can also be entered manually using the keyboard.

You can configure eZ-Balance to have from 1 to 7 balance planes. The setup includes 1 tach input channel and from 1 to 7 response channels. Accelerometer, Velocity, and Displacement probes are examples of Response Channels.

You can interactively review the vibration data and balance results in graphical format. A balance toolkit is provided for typical balance calculations, such as splitting weights.

* A WBK18 or WBK14 module is required when using a WaveBook/516 Series device.

** eZ-Balance can be used for the dynamic channels of the 655 device, but not for the temperature channels. If you will be using a 655 for temperature applications you will need to use other software, such as eZ-TOMAS or DASYLab.

Installing and Starting the Application

System Requirements

Verify that your computer system meets or exceeds the following minimum requirements.

- For Ethernet devices - 10/100BaseT Ethernet port [on PC or on a hub connected to the Ethernet]
- Monitor: SVGA, 1024 x 768 screen resolution
- **Requires 32-bit version of Windows**: Windows 2000 SP4, Windows XP, or Windows Vista (x86)
  Windows 2000 SP4 and Windows XP Users: PC with Intel™ Pentium 4 or equivalent;
  1 GB memory; 10 GB disk space
  Windows Vista (x86) users: PC must be *Windows Vista Premium Ready*

Verify that you have:

- Dynamic Signal Analysis (DSA) CD
- License Key (authorization code) for eZ-Balance
- Data acquisition hardware; e.g., acquisition device, sensors, cables, power supply
- User documentation: available in pdf format on CD and on-line at: www.iotech.com

Software Installation

1. Start Windows.
2. Close all running applications.
3. Insert the Dynamic Signal Analysis CD into your CD-ROM drive and wait for the CD to auto-run.

   Note: As an alternative to using the CD, you can download the application from our website. If using the website, follow the download instructions there.

   If the CD does not start on its own:

   (a) click the desktop's <Start> button
   (b) choose the Run command
   (c) select the CD-ROM drive, then select the **setup.exe** file.
   (d) click <OK>

   An *Opening Screen* will appear
4. Click the <**ENTER SETUP**> button.
5. From the hardware selection screen [which follows a licensing agreement], select the type of data acquisition device you are using from the drop-down list.
6. Continue to follow the on-screen instructions.

Reference Notes:
As a part of product support, when installing the application from the CD, PDF versions of documents [pertaining to hardware and software] are automatically installed onto your PC's hard-drive. The default location is the **Programs** group, which can be accessed via the *Windows Desktop Start Menu*. The PDF documents are also available in the Tech Support section of our website.

Running eZ-Balance

To run eZ-Balance double-click the associated icon or use your Windows desktop Start button to navigate to the program. The application is located in the **Programs** group by default.

The first time you start the application you will be prompted for your name, your company name, and the license key (authorization code) that will activate eZ-Balance for every day operations.

The authorization code accompanies the CD. However, if you downloaded your software from the website, your code will be e-mailed to you within one business day.

Note: If an error should occur, which results in eZ-Balance not booting up, delete the **EZBal.ini** file [located in the executable's directory]. The .ini file identifies the last Job opened. You can delete this file without affecting your data. After deleting the file you should be able to open the last balancing job.

Overview of the Balance Job

Each balance "job" in eZ-Balance is unique. For example, if you have two motor driven fans you will have two separate eZ-Balance Jobs, one for each fan. Each job will have its own set of configuration and data files that can be stored and later retrieved. When you create a new eZ-Balance job the current configuration is copied to the new job.

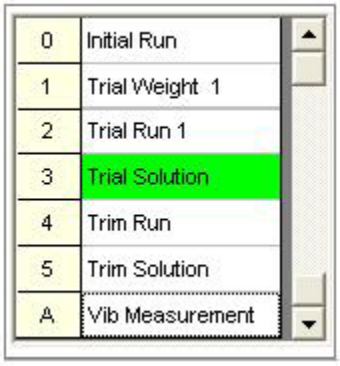
After you have configured your eZ-Balance job you are ready to begin the Balancing Process. You need to collect vibration data at several machine conditions (runs). These runs include the initial "as found" run, the trial run(s), and the optional trim run. The initial run is the machine's condition prior to any balance efforts. The trial run(s) measure the vibration effect of adding trial weights to each balance plane. The number of trial runs equals the number of balance planes. Lastly, the optional trim run can be used to measure the effect of the trial solution.

Vibration data is the vibration amplitude and phase measured at the machine's running speed (frequency). These values are commonly referred to as the first order amplitude and phase. Enter the trial weight and location values prior to each trial run.

The vibration data can be either:

- Automatically measured using the acquisition device, or
- Entered manually using the keyboard.

The Balance Operations selection grid identifies where you are in the balance process via a green highlight for the associated cell; for example "3 Trial Solution" as in the figure. After the *trial runs* have been completed a trial balance solution can be determined. After the *trim run* is performed, you can obtain the trim balance solution. Chapter 2 contains detailed information.



Balance Operations Selection Grid

Connecting the Data Acquisition Device

Refer to your hardware documentation in regard to connecting hardware and signal lines; and in regard to product specifications.

Hardware documents, in PDF format, can be obtained from the following locations:

- Directly from the installation CD (select "Manuals" from the CD's splash screen)
- From the online Tech Support section at www.iotech.com
- From the Programs group on your CD, providing that you installed your software from a CD

Note that ZonicBook/618E, WaveBook/516 Series, and IOtech 600 Series** devices are configured entirely via software.

In regard to connecting sensors, the following table may prove useful as a general guide.

Sensor Type	Single-Ended (SE) or Differential	Coupling	ICP
Proximity	SE	DC*	OFF
Accelerometer/Velocity	SE	AC	ON or OFF Depending on the instrument
Tach	SE	AC	OFF

*Typically, Proximity and DC proportional signals should be DC coupled.

At this point you should be ready to look at the steps required for a balancing project. These are presented in the next chapter.

** eZ-Balance can be used for the dynamic channels of the 655 device, but not for the temperature channels. If you will be using a 655 for temperature applications you will need to use other software, such as eZ-TOMAS or DASYLab.

Notes

- Use a standard channel location convention for your Tach and Response channels. *Typically*: Tach is channel 1 and Response channels are 2 and above.
- If you aren't getting a Tach Trigger, verify the Tach channel's FSV, Trigger Level Percentage, and Direction.
- If an error should occur, which results in eZ-Balance not booting up, delete the **EZBal.ini** file [located in the executable's directory]. The .ini file identifies the last Job opened. You can delete this file without affecting your data. After deleting the file you should be able to open the last balancing job.

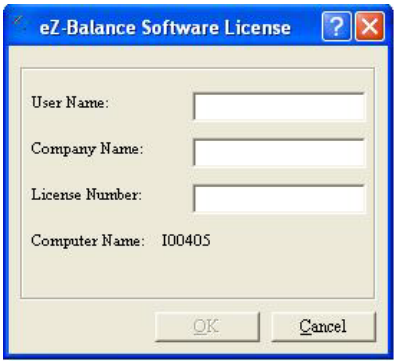
1. Start eZ-Balance

To run eZ-Balance, double-click the eZ-Balance icon or use your Windows desktop Start button to navigate to the program file [or to wherever you installed the program].

The first time you run eZ-Balance, the Registration Form will open (following figure). You must complete the registration form in order for eZ-Balance to operate.

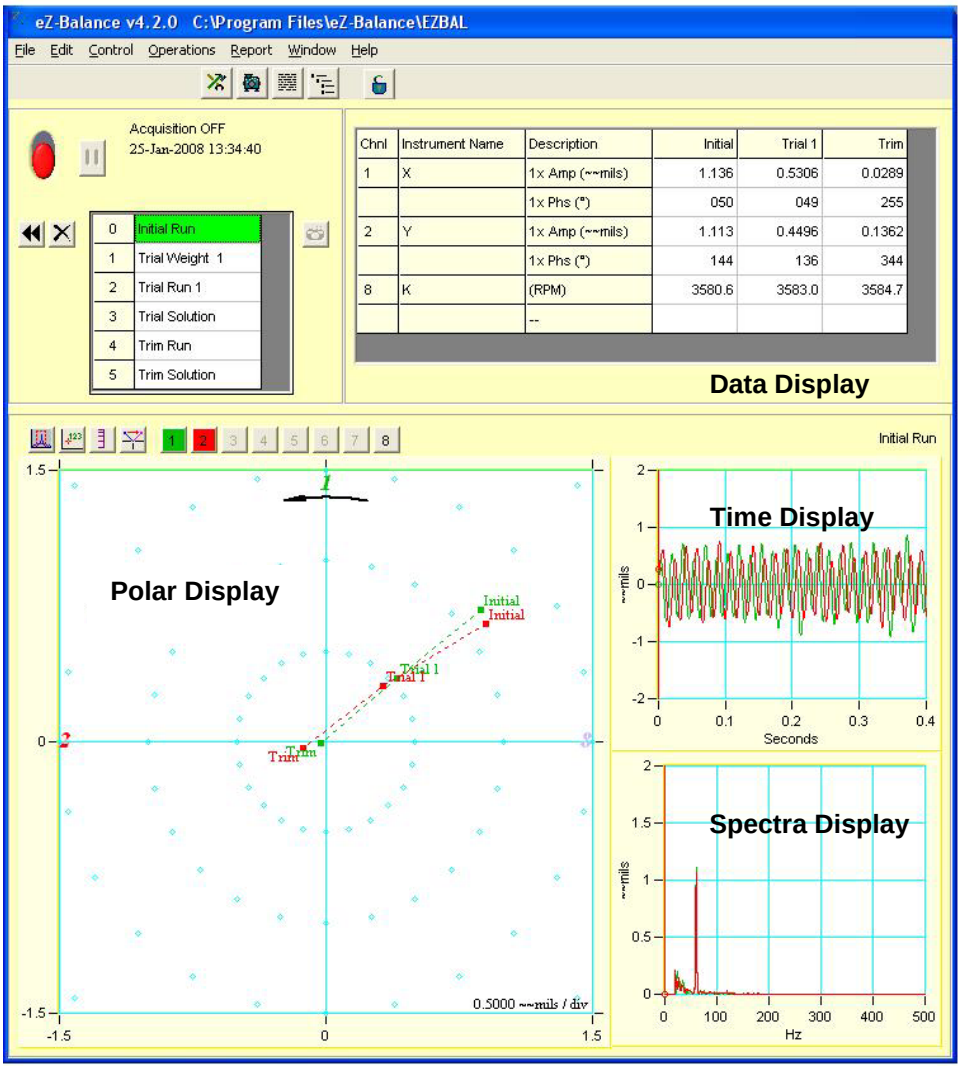
The license number accompanies the CD-ROM, or can be provided via e-mail if you downloaded eZ-Balance from the Web Site. You will not have to re-enter this information again, unless you upgrade to a newer version, or if you reinstall eZ-Balance.

Should you need to access the form, for example if you received a license for an upgrade, it can be accessed through the Help pull-down menu. From the available selections, pick "About eZ-Balance...;" then click the <Update License> button. A screen similar to the following will appear.



License Registration Form

After you complete the form and click <OK>, the eZ-Balance Main window will open. The main window provides access to several other windows that you will use interactively throughout the balancing project.



Main Window with its four Displays

2. Create a New Job

1. From the File pull-down menu, select "New eZ-Balance File." This opens the Save As dialog window.
2. Select or create a folder for your eZ-Balance Project.

TIP: We recommend you store all jobs in a separate "Jobs" folder. This allows for easier file maintenance.

3. Enter the name for the eZ-Balance Project.
4. Click the <Save> button to create the new project.

3. Modify the Device Setup for On-line Balancing

After you create a new eZ-Balance job, you need to verify that the default setup is valid for your job. To modify the Acquisition and Input Channels parameters:

a. With the acquisition turned OFF, open the Edit pull-down menu.

b. Select "Configuration."

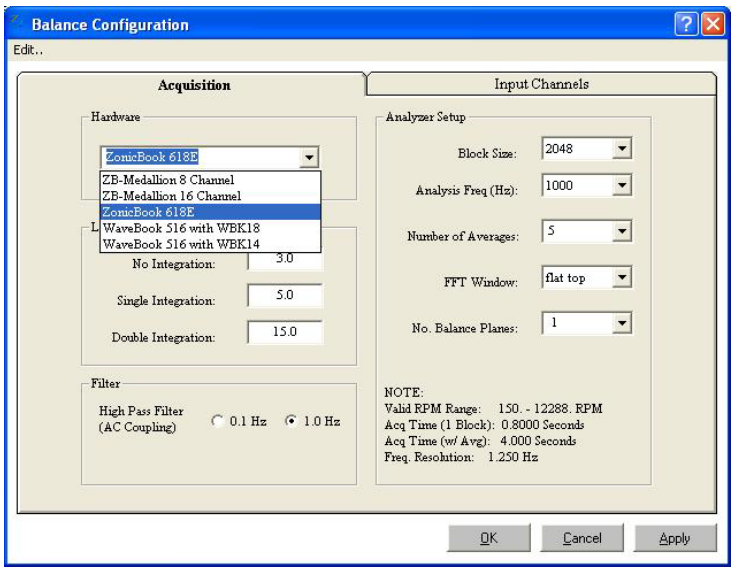
c. From the Acquisition Tab's Hardware pull-down list, select the applicable data acquisition hardware.

You cannot access the Balance Configuration window while Data Acquisition is active. The control switch must be set to "OFF."

Setup Acquisition Tab

Use this panel to select the applicable data acquisition hardware and configure the acquisition parameters for the eZ-Balance Job. If you make any changes, be sure to click the <Okay> or <Apply> button.

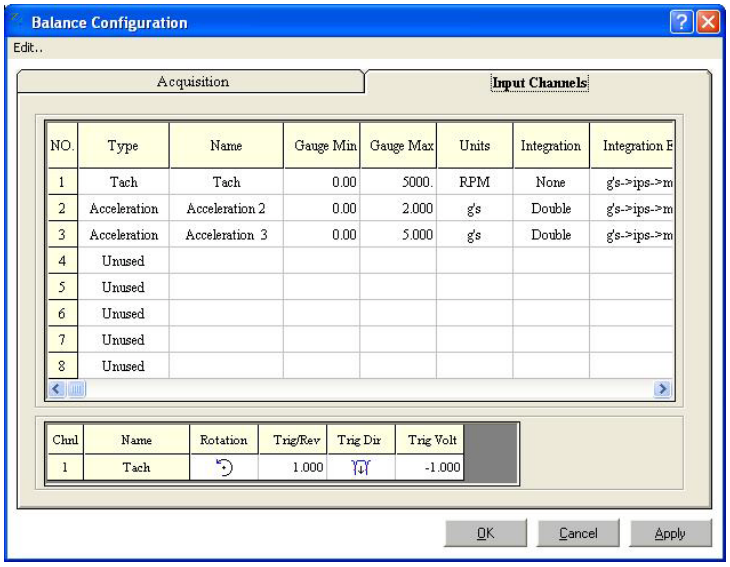
The number of balance planes can be equal to or less than the number of response inputs.



Balance Configuration, Acquisition Tab

Input Channels Tab

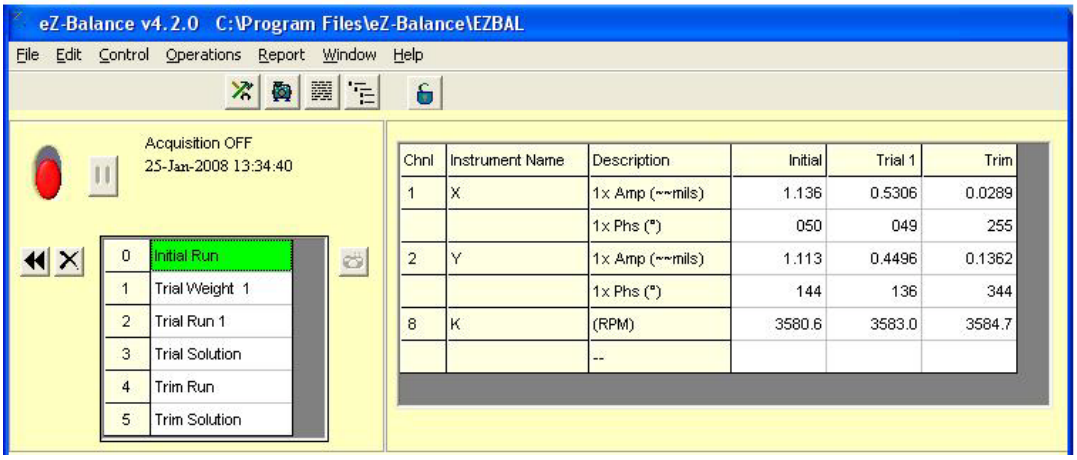
Use this panel to configure each channel for your balance job. Select a channel then set the values for each attribute. Repeat for each channel.



Balance Configuration, Input Channels Tab

4. Perform Balancing Operations

Balance Data can be acquired with the acquisition device on-line, or it can be entered manually (off-line). Use the Balance Operations flowchart to sequentially select the balance project's steps. The number of Balance Steps depends on the number of Balance Planes. There will be a Trial Run for every Balance Plane.



Balance Operations Flowchart
Selecting (0) Initial Balance Run

The number of balance steps depends on the number of balance planes. There will be a trial run for every balance plane.

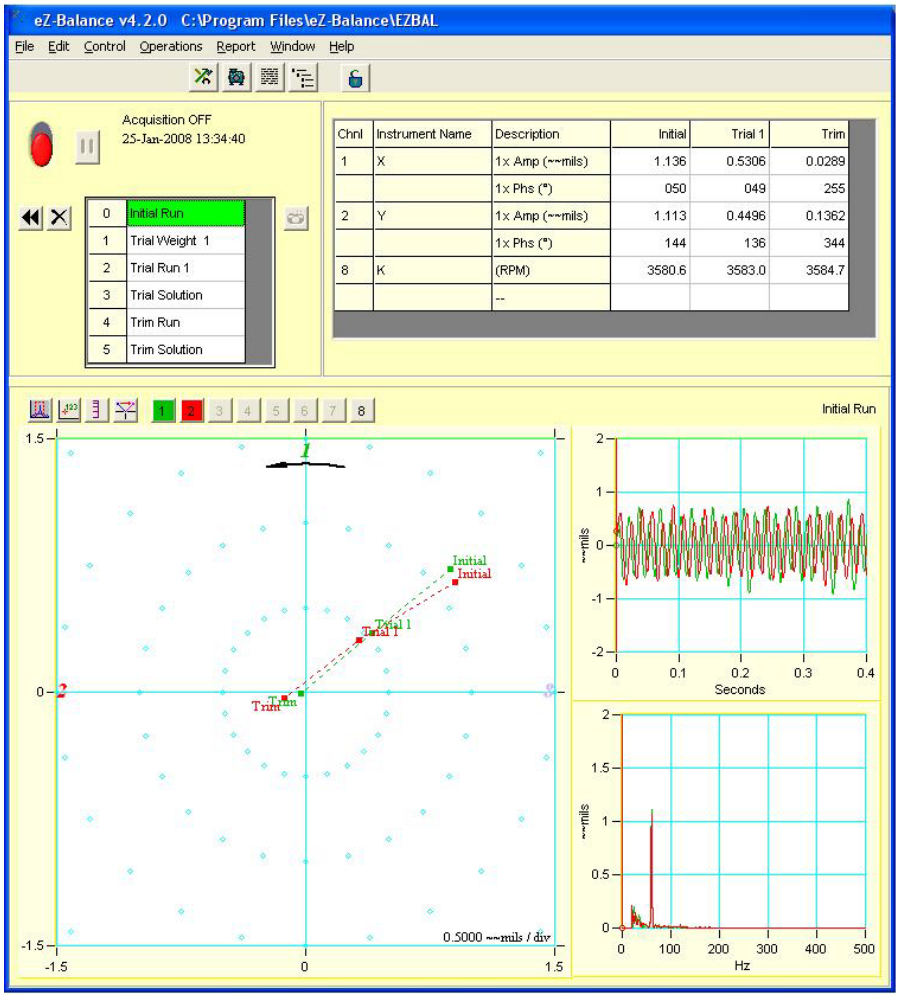
Operation: Initial Balance Run

The first step is to perform an initial balance run. This is the "as found" condition of the machine.

Note: Data in graphics is for presentation purposes only.

On-line Method

Before acquiring vibration data, verify that your data acquisition device is properly connected and configured. Refer to your product user's manual as needed. IOtech CDs include PDF versions of the associated documentation.

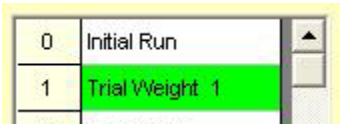


Main Display Window

Click the Toggle Switch in the Control Panel to enable the data acquisition. The Vibration Data table (following figure) displays the measured Speed, 1x Amp, and 1x Phase values. After the machine reaches a steady state, and data has been collected and averaged, you are ready to proceed to the next step.

Chnl	Instrument Name	Description	Initial	Trial 1	Trim
1	X	1x Amp (~~mils)	1.136	0.5306	0.0289
		1x Phs (°)	050	049	255
2	Y	1x Amp (~~mils)	1.113	0.4496	0.1362
		1x Phs (°)	144	136	344
8	K	(RPM)	3580.6	3583.0	3584.7
		--			

Vibration Data Table

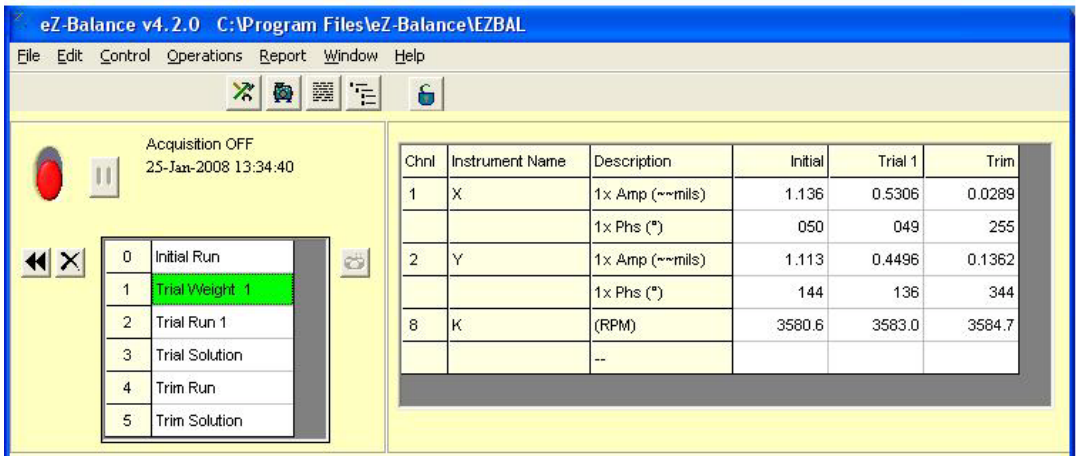


Click on "Trial Weight 1." This will automatically save the Initial Run data and Pause the acquisition.

Off-line Method

Manually enter the data into the Vibration Data table; then proceed with the next operation, Add Trial Weight.

Operation: Add Trial Weight



Add Trial Weight

The "Add Trial Weight" operation does the following:

(1) logs the vibration data for the current Run

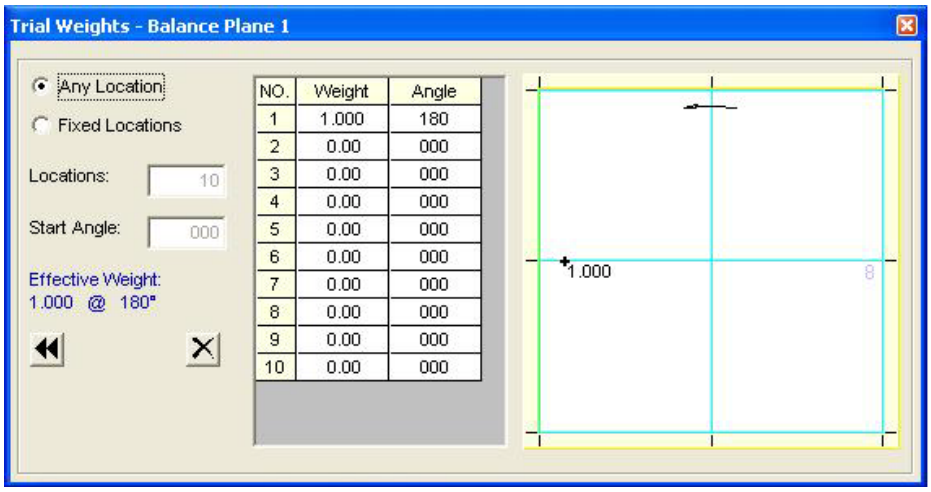
(2) pauses the acquisition, and

(3) brings up a Trial Weights box

View the plotted vibration data and determine where you may need to add balance weights. Add the weight to Balance Plane 1. In the Balance Weights window you have a choice of selecting "Any Location" or "Fixed Locations." See the following figure.

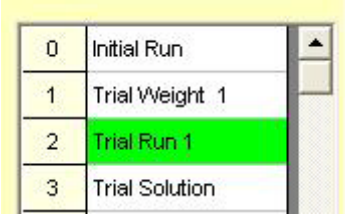
The "Any Location" setting allows you to enter up to ten trial weight vectors (weight and angle).

The "Fixed Locations" setting is for evenly spaced locations for the trial weights. When this option is selected enter the number of weight locations and the desired starting angle for the first weight. eZ-Balance will automatically enter the remaining angles. The default is for 10 locations, starting with angle °0, and with each location set apart by 36 degrees.



Balance Weights Window

Operation: Trial Balance Run

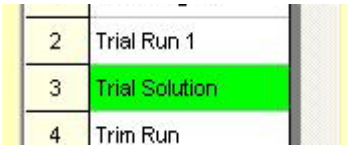


Use the same vibration acquisition method to obtain Trial Run Vibration data. Repeat these operations for each Balance Plane.

Chnl	Instrument Name	Description	Initial	Trial 1	Trim
1	X	1x Amp (~~mils)	1.136	0.5306	0.0289
		1x Phs (°)	050	049	255
2	Y	1x Amp (~~mils)	1.113	0.4496	0.1362
		1x Phs (°)	144	136	344
8	K	(RPM)	3580.6	3583.0	3584.7
		--			

Vibration Data Table

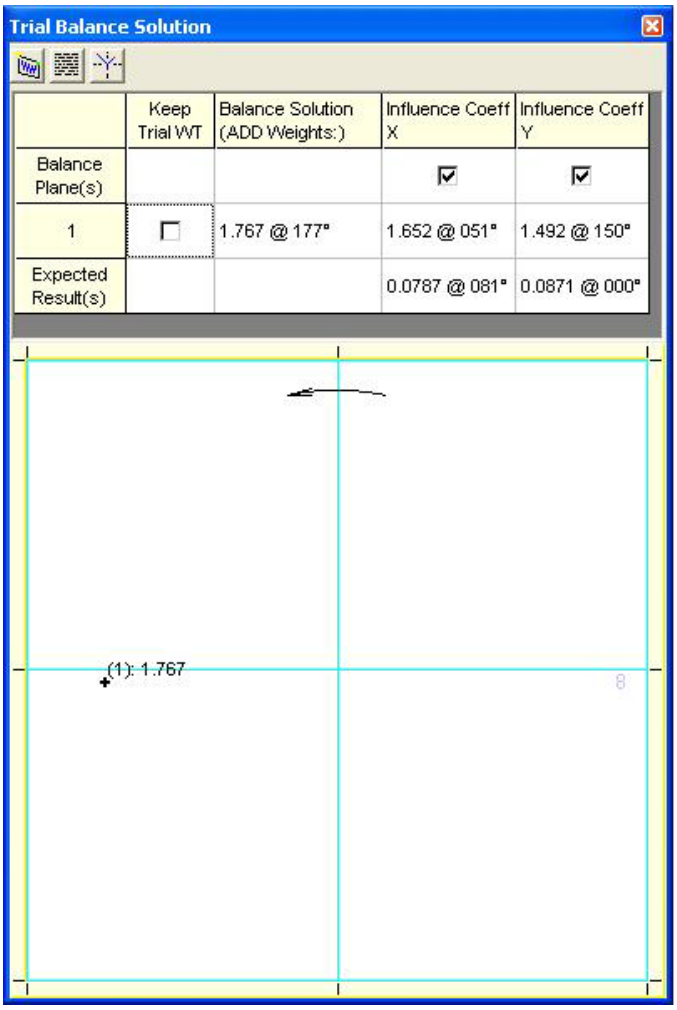
Operation: Calculate the Trial Solution



Calculate Trial Solution

Click the Trial Solution cell.

The Solution area of the Balance Weights window indicates the weight and location to place the final correction; and includes influence coefficients.

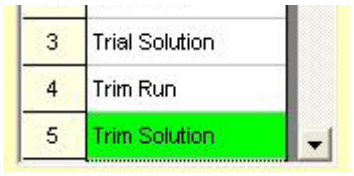


Operation: Trim Balance Run

Trim Balance Run

Perform a Trim Balance Run to verify the Balance solution.

Operation: Calculate the Trim Solution



Calculate Trim Solution

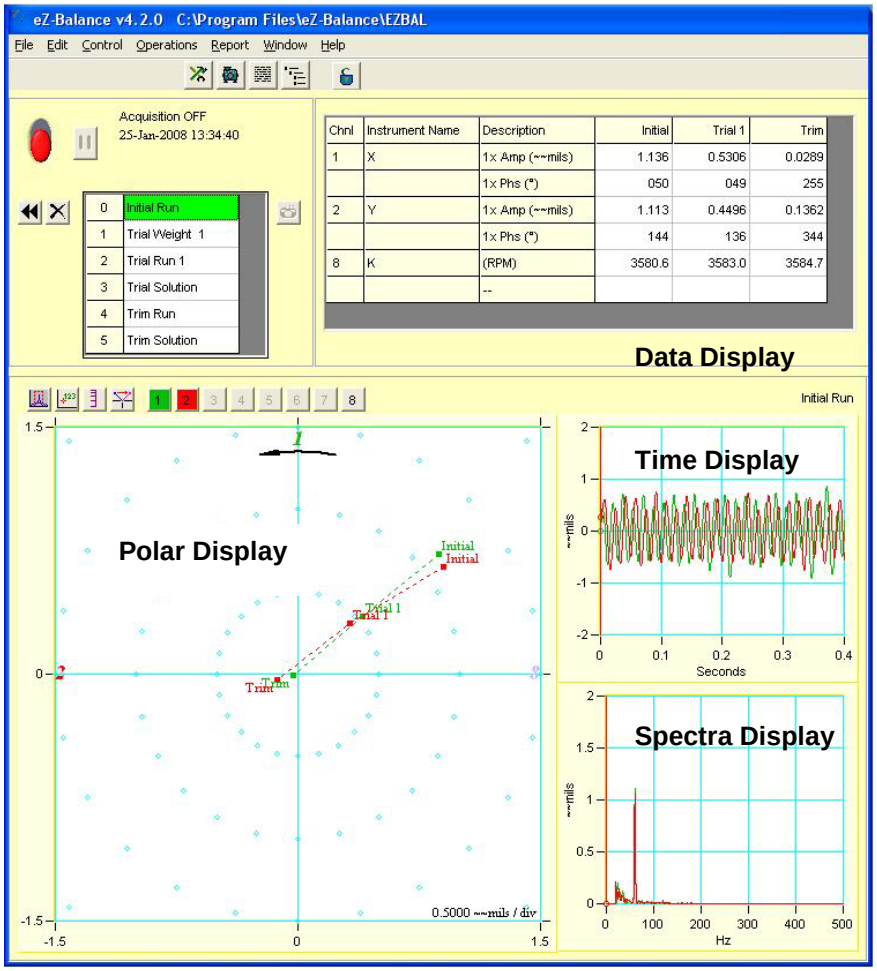
A Trim Solution provides an updated Balance Solution using the Trim Run results. Repeat Trim Balance Runs as needed.

1. Calculate a trim solution.
2. Add trim weights.
3. Perform a Trim Balance Run to verify the new balance solution.
4. Repeat the process as desired to fine tune the balance.

If the Balance Solution does not provide desired results, the unsatisfactory vibration levels may be due to other machine problems, such as misalignment.

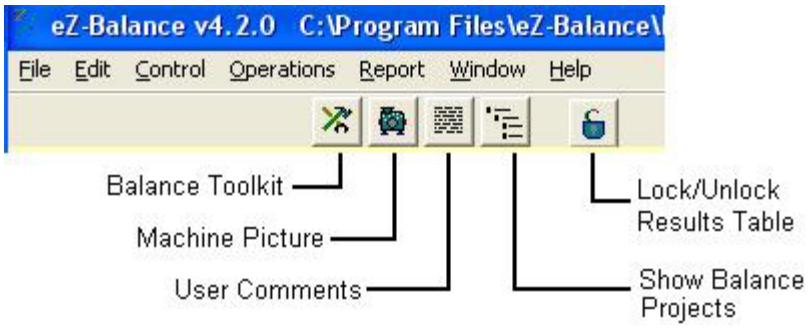
The Main Window

The Main window is comprised of menus, buttons, and windows needed to complete a balancing project.



Main Window with its four Displays

Windows Selection Buttons

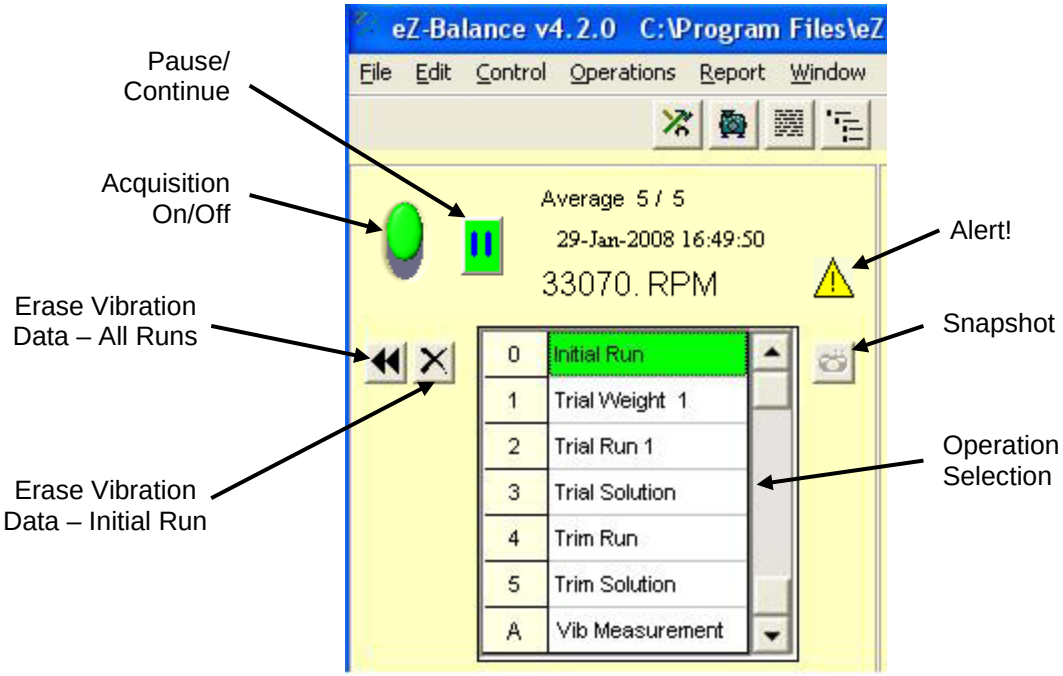


The buttons can be used instead of the associated selection in the Windows pull-down menu, which is discussed on page 3-14.

	Button	Function and/or Comment
	Balance Toolkit	Opens the Balance Toolkit window with its 9 tools for performing various weight-related calculations. Chapter 4 is devoted solely to the Balance Toolkit and should be referred to for details.
	Machine Picture	Brings up the Machine Picture window, which allows you to add [or remove] a .jpg or .bmp picture image via its Edit menu. When the add function is selected a window appears, allowing you to browse for, and select, the desired image.
	User Comments	Brings up a window, which allows you to enter text. The window is typically used to add project notes.
	Show Balance Projects	Brings up a window, which lists currently saved projects. You can select a project from the list for post data viewing.
	Lock/Unlock Results Table	A password can be used to lock out editing of the results grid. The state of this feature may be saved in the eZ-Balance file such that a project can be configured for locked editing of results and distributed to a testing environment with manual editing disabled. You can open the password dialog directly from the Window pull-menu, or by clicking on the lock icon button [regardless of state]. The "Set Password" entry (in the pull-down menu) is disabled whenever the state of the interface is 'locked,' i.e., red icon condition. **Note**: The default password used, for example in the case of importing legacy files, is '**ZBAL**'. Passwords are case sensitive. New projects use the most recent password; and default to the 'unlocked' state.

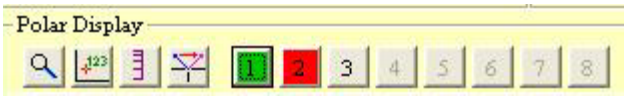
Control Buttons and Operation Selection Cells

The Control section of the main window includes a toggle-switch, several buttons, operation selection cells, and a high RPM "alert" feature. The operations offered by the selection cells (following figure) are discussed in chapter 2, with exception of selection "A" (Vib Measurement) and the "Alert" feature which is briefly discussed below. The **Vib Measurement** operation instructs eZ-Balance to measure vibration data while foregoing the balancing operation.



Button	Comment
Pause/Continue	**<Pause/Continue>** is used to temporarily halt an acquisition, and to restart it.
Acquisition On/Off	Turns an acquisition On or Off. Red (down) is "Off." Green (up) is "On."
Snapshot	Click the < **Snapshot >** button to save the current acquisition data to the History file. The History file is FIFO (first in first out). The number of records in the file is set in the acquisition tab of the Configuration window.
Erase Vibration Data - from <u>previous</u> <u>single</u> run	When this button is clicked the previous single run of vibration data is instantly erased. There is no warning prompt.
Erase Vibration Data - from <u>all</u> runs	After clicking this button a message box states: "WARNING - All vibration data will be erased. Do you wish to continue?" If so, click the <Yes> button. Otherwise, click <No>.
Alert !	If the input tachometer's frequency (number of tach pulses per second) is greater than the analysis frequency, *and not yet attenuated by the input anti-aliasing filter*, then an RPM alert indicator is displayed. The alert icon is an exclamation point encased in a yellow triangle. If the input tachometer frequency is attenuated by the input anti-aliasing filter, then the RPM will be represented as zero and the indicator will not be displayed.

Display Task Bar



Plot Display Task Bar

The Plot Display task bar is located at the top edge of the Polar Display panel; but applies to the Time and Spectra Displays in addition to the Polar Display. The task bar is used to select the active channels to be displayed and to adjust display parameters in regard to scale, and as to whether or not runout compensation should be applied. The task bar includes a button for turning the annotation function on or off.

	Button	Function and/or Comment
	Scale *3 modes*	**Auto Scale** – Automatically sets the scale. **User Scale** – Left-click near the high or low ends of the x and/or y axis to access a numeric field, which allows you to enter new maximum and minimum values. **Instrument Scale** - sets the scale according to the instrument
	Data Annotation	For the chart displays, this button is used to turn annotation (x,y data values) on or off.
	Log Scale	The Log Scale button applies to the Spectrum Display. The button toggles the scale from Linear to Logarithmic and visa versa.
	Apply Runout	This button should be clicked when the machine is running at full speed so that runout compensation can be applied.
	Channels (8 buttons)	These buttons are used to select (or deselect) the input channel(s).

Vibration Data Display

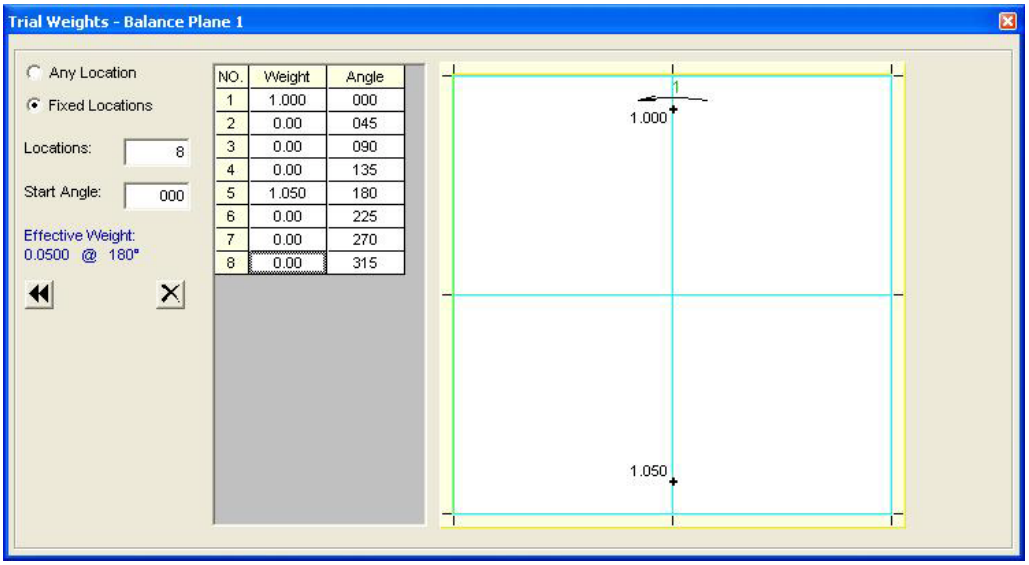
Chnl	Instrument Name	Description	Initial	Trial 1	Trim
1	X	1x Amp (~~mils)	1.136	0.5306	0.0289
		1x Phs (°)	050	049	255
2	Y	1x Amp (~~mils)	1.113	0.4496	0.1362
		1x Phs (°)	144	136	344
8	K	(RPM)	3580.6	3583.0	3584.7
		--			

Vibration Data Display

The Vibration Data table shows the vibration data for each balance run. The data can be entered manually, or collected on-line through the data acquisition device.

The vibration data is plotted in the Polar, Time, and Spectra displays.

Balance Weights Window



Balance Weights Window

This window contains a table for displaying the amount of weight added to specific locations (angles). Angle selection can be made in either of two ways; (1) "user designated" [via the <Any Location> radio button] and (2) "automatic" [via the <Fixed Locations> radio button].

Selecting the <Any Location> radio button allows you designate the angles at which the weights will be place. This option is limited to 10 locations.

Selecting the <Fixed Location> radio button allows you to set the Start Angle and the Number of Locations. The other locations are automatically set at equal angles, based on the number of locations.
For example, in the preceding figure the specified number of locations is 8. Each of the 8 locations is 45 degrees from the preceding and following locations. When fixed locations are used there must be at least 2; and not more than 360.

TIP: Be aware of your units of weight and be consistent in their use. The units are not displayed in the Balance Window.

The two buttons at the window's lower left have the following use.

Clears the weights for the current balance plane.

Clears the weights for all balance planes.

File Menu

The file pull-down menu contains five standard application commands.

New eZ-Balance File - creates a new file for your new balance job.

Open eZ-Balance File - opens an existing file for your balance job.

Save eZ-Balance File - saves project in its current state.

Save As – Opens the "Save As" window allowing you to select an existing file name or create a new one and choose the location where you want to save the file. For the type of file save you will need to use eZ-Balance Projects (*.ezb).

Print Screen - opens the Print dialog box.

Exit – closes and exists eZ-Balance.

Edit Menu

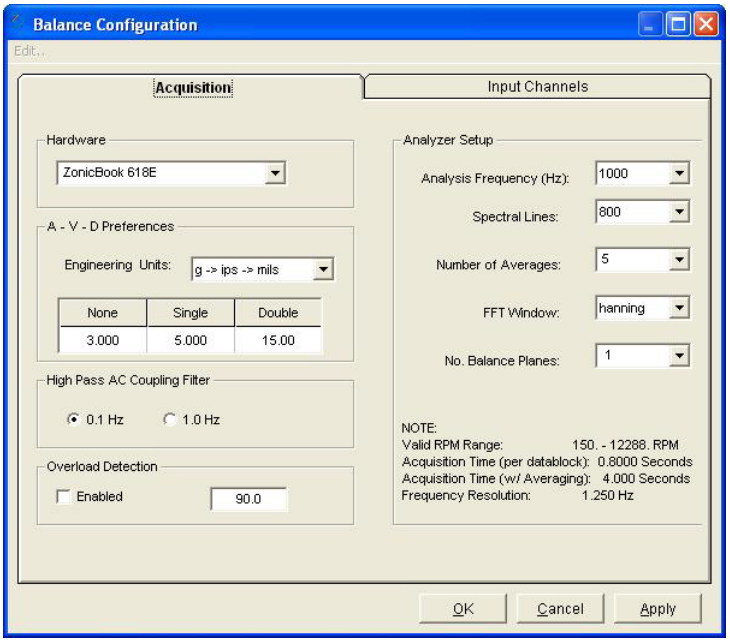
The Edit menu contains the following selections:

Configuration
Display Preferences
Copy . . . Screen / Polar Plot / Vibration Plots

Edit Menu > Configuration

Selecting Configuration brings up a window with two tabs. Use the Acquisition Tab to configure the general acquisition parameters. Use the Input Channels Tab to set the tach and input channels. Tab details follow.

Edit Menu > Configuration Menu > Acquisition Tab



Balance Configuration Acquisition Tab

Configuration Menu . . . Analyzer Tab	
Panel	**Function(s)**
Hardware	This panel consists of a pull-down list from which you must select your data acquisition hardware.
Low Frequency Cutoff Hz	This panel allows you to set values for: No, Single, and Double Integration. Low frequency cutoff is used to remove the low frequency effects of integration. All spectral amplitude values below the specified frequency value are set to zero.
Filter	Used to set the High Pass (AC Coupling Filter) to 0.1 Hz or to 1.0 Hz. Note that coupling is set to AC or DC in the Input Channels tab. Select 1.0 Hz for machines with RPM > 300.
Analyzer Setup	This panel is located on the right-side of the Balance Configuration tab. It includes pull-down lists for the following items:
Spectral Lines	The number of lines per spectrum and the number of data samples used in the FFT (Fast Fourier Transform) process. The more spectral lines, the greater the data resolution. As the number of spectral lines increases, so does the time that it takes to collect the data and the amount of disk space.
Analysis Frequency (Hz)	This value is the maximum frequency of interest. The sampling rate will be 2.56 times the analysis frequency. Verify the maximum frequency response of your probes. Typically, the analysis frequency will be 5x the Machine's Rotating Speed.
Number of Averages	The averaging function is a rolling buffer that averages the last "n" data blocks. The typical number of averages is 5.
FFT Window	Options are None, Hanning, Flat Top, or Blackman Harris. Hanning provides better frequency resolution. Flat Top provides better amplitude resolution.
No. Balance Planes	eZ-Balance can have between 1 and 7 balance planes, up to the number of response inputs.

The lower right section of the Analyzer Setup tab includes a note which states:

Valid RPM Range

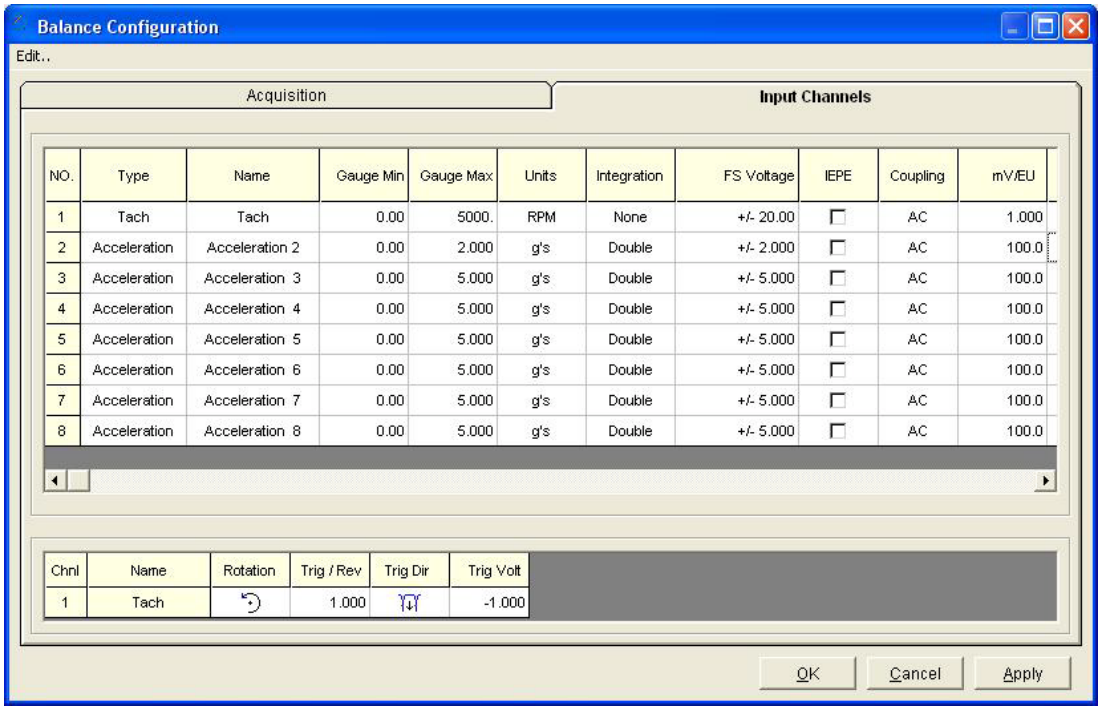
Acquisition Time (for 1 block)

Acquisition Time (weighted average)

Frequency Resolution

Edit Menu > Configuration Window > Input Channels Tab

The Balance Configuration window includes an Input Channels tab (following figure). Use this tab to configure each input signal. Set the values for each attribute on a channel by channel basis. Note that the following figure does not show all attributes. To view additional attributes you would use the scroll bar [below channel 8] and scroll to the right. A table of channel attributes follows.

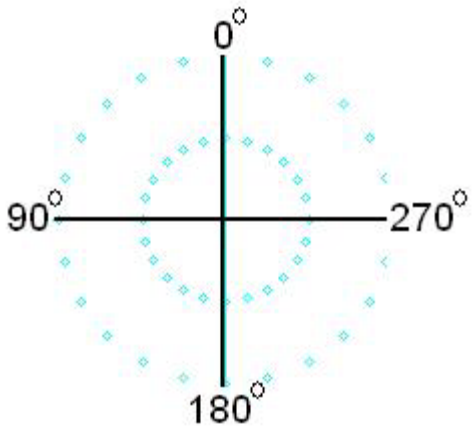


Balance Configuration Input Channels Tab

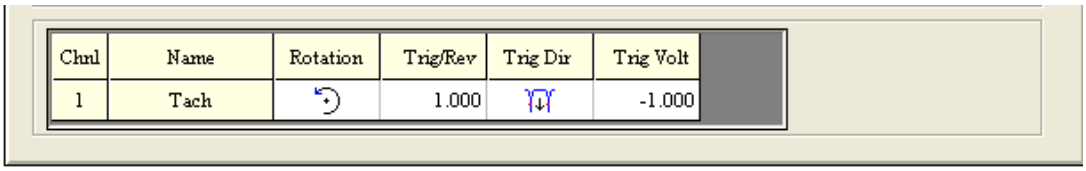
Configuration Window . . . Input Channels Tab	
Attribute	**Comments**
Type 	• This is the *type of instrument* that will be connected to the selected channel. Instrument Types include: Accelerometer, Velocity, X probe, Y probe, Z probe, and Tach. Make your selection on the pull down menu. If no instrument will be connected to the channel select "unused." • You must have 1 Tach Channel and 1 or more Response Channels. **For IOtech 650, CH5 should never be configured as an accelerometer channel since it has no IEPE capability.**
Name	Enter a name, or label, for the selected channel.
Gauge Min **Gauge Max**	Enter the instrument **Range: Minimum** and **Maximum** in engineering units.
Units	Default engineering units are based on the Instrument Type selected. To change the units, double-click on the cell and type in the desired unit label.

Configuration Window . . . Input Channels Tab	
Attribute	**Comments**
Integration **None** **Single** **Double**	Accelerometer and velocity signals can be integrated. Select the desired integration type [None, Single, or Double]. To do this, left-click on the cell and select the integration type from the resulting list. In regard to integrating acceleration and velocity: . . . for **Acceleration**: *single integration* results in velocity. *double integration* results in displacement. . . . for **Velocity**: *single integration* results in displacement.
FSV **(Full Scale Voltage)**	Select the maximum Full Scale Voltage that is expected for the instrument. Erroneous results will occur if you select a voltage value that is less than the actual input voltage. If you are unsure of the instrument's maximum voltage value, select a high voltage value [i.e.: +/-25V for displacement probes; +/- 5V for accelerometers and velocity sensors.]
IEPE (Integral Electronics Piezoelectric)	The Institute of Environmental Science and Technology adopted the term IEPE (Integral Electronics Piezoelectric) to identify what had been commonly referred to as ICP® (Integrated Circuit Piezoelectric). The two terms are synonymous; however, ICP is registered by PCB Pizeotronics. A constant bias current is available for IEPE transducers that are used as signal input for associated analog channels and for compatible expansion modules that accept IEPE transducers, for example, the WBK18. The bias current is sourced through the center conductor of the input channel BNC connector and returns to the acquisition device via the BNC's outer conductor. The current source features an operating compliance voltage (see specs) and is protected in regard to both short-circuit and overvoltage. Operating compliance refers to the highest voltage that can be applied without change of the current source value. For applications that do not require bias, the current source can be disconnected from the input by un-checking IEPE in the Input Channels tab on a per-channel basis. Checking a channel's IEPE cell enables the current source for that channel. With IEPE enabled, level detection circuitry continuously monitors the channel's input voltage. Recognition of a voltage greater than 25V (transducer open) or less than 1V (transducer short) triggers a transducer fault condition for the associated channel. This error is communicated via a software status request at the end of an acquisition. In addition, some devices include LEDs to communicate transducer faults. When recognized, an error is latched until the commencement of a new acquisition. Consequently, even intermittent faults are detected and communicated. Detection of a fault does not, however, alter the acquisition process or its data. When the IEPE function is not available to a channel a dash appears in the IEPE column for the associated channel.

Configuration Window . . . Input Channels Tab	
Attribute	**Comments**
Coupling	AC or DC coupling can be set on an individual channel basis. Coupling is available for analog channels (CH1 through CH8) and for compatible expansion channels [e.g., from a WBK18]. AC Coupling can be set to a high pass filter value of 0.1 Hz or 1 Hz. The value is selected in the Analyzer Tab. Note that when DC Coupling is selected the high pass filter is bypassed. When the Coupling function is not available to a channel, or not used by a channel, a dash appears in that channel's Coupling column.
mV/EU	This is the instrument's input *Sensitivity*. Typical accelerometers have a sensitivity of 100 mV per g. Displacement probes have 200 mV per mil. For Tach probes enter 1000 mV per Volt.
Angle	Angle refers to the physical angular location of a probe. Zero degrees is defined to be TDC (+y-axis). The angle value is measured in the counterclockwise (CCW) direction. Typically viewed from the driver end. Instrument angle is used for data display.
1xA Ref **1xP Ref**	The 1x (first order) Amplitude and Phase values are used for Runout Compensation on Bode or Polar displays. These values are commonly known as Slow Roll Compensation values and should be collected during machine slow roll conditions (i.e.: Speeds < 500 rpm). The values must be between the Maximum and Minimum EU range.



For Tach Probes, you will need to enter the following information. The tachometer related information is entered at the lower section of the input channels tab (see previous figure).



Rotation	Select the machine's Rotation Direction, either CCW (counter-clockwise) or CW (clockwise) on the pull down menu. The rotation direction is typically viewed from the driver end. Rotation direction is used for data display correction.
Trig/Rev	Enter the number of tach trigger pulses per shaft revolution. This number must be 1 for all Balance Jobs. Phase can not be calculated if the number of trigger pulses is greater than 1.
Trig Dir	Select the tach's trigger pulse direction, either Negative or Positive. Typically this is the direction of the tach signal's leading edge. Trigger voltage and direction define the start of a shaft rotation. A keyway will generate a Negative Tach pulse.
Trig Volt	The tach's Trigger Voltage number must be less than the tach's FSV. A tach pulse is recognized when the tach signal exceeds the trigger voltage in the trigger direction specified. Trigger voltage and direction define the start of a shaft rotation. Typical Tach signals will generate at least a 1 V pulse.

Notes:

- Use a standard channel location convention for your Tach and Response channels. Typically: Tach is channel 1 and Response channels are 2 through 8.
- If you aren't getting a Tach Trigger, verify the Tach channel's FSV and Trigger Level Percentage and Direction.

Edit Menu >Configuration Window> Input Channel Tab > Edit

This pull-down menu is located at the upper left side of the Balance Configuration Window. It can only be opened when the Input Channels tab is active. Menu items are as follows:

Set Defaults	Sets instrument's attributes to the default values, based on the defined instrument type.
Copy Channel	Copies the channel attributes of the channel where the cursor is currently residing.
Paste Channel	Pastes the copied channel attributes to the channel where the cursor is currently residing.
Fill Down	Copies the channel attributes of the channel where the cursor is currently residing and copies them to all succeeding channels that are not marked "unused."
Fill Up	Copies the channel attributes of the channel where the cursor is currently residing and copies them to all preceding channels that are not marked "unused."

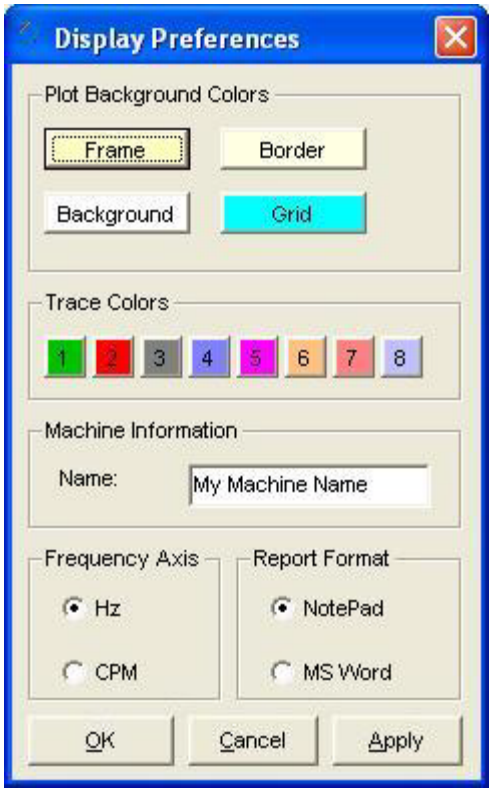
Edit Menu > Display Preferences

From the Display Preferences window you can set plot related colors, e.g., frame color, border color, grids, etc. It is from this window that channel trace colors are set.

In addition to the parameters just discussed, you can:

- Use the Machine Information panel to identify the machine by name.
- Use the Frequency Axis panel to label the frequency (x-axis) in Hz or CPM.
- Use the Report Format panel to choose NotePad or MS Word as the format for the Balance Configuration Report, which is selected from the Report pull-down menu. You can paste the report into other documents.

After making changes to the display preferences, remember to hit the <OK> or <Apply> button. Otherwise the changes will not take effect.



Edit Menu > Copy . . . Screen / Plot Window / Vibration Data

There are three individual copy options: Copy Screen, Copy Plot Window, and Copy Vibration Data. Each is a command to copy the specified screen image. After copying the image you can paste it into a text document such as MS Word or a graphics application, such as MS Paint.

Control Menu

With exception of its "Save Balance Operation Data" function, the Control pull-down menu mimics the functionality of the Control section of the Main Window. The menu allows you to start and stop acquisitions, pause and continue acquisitions, and to save data.

Operations Menu

This menu has the same options as does the Main Window's Balance Operation selection grid; i.e., Initial Run, Trial Weight, Trial Run, etc. Refer to chapter 2 for a description of the operation levels.

Report Menu

This menu allows you to generate reports for Balance Solutions and Balance Configurations. Reports are created in Microsoft Notepad as *.txt files.

Note that the reports can be edited, just like with any other *.txt file. An example of a partial report follows:

ACQUISITION CONFIGURATION

Hardware Device: WaveBook 516 with WBK14
Analysis Rate: 1000 Hz
Blocksize: 2048
Averages: 5
Cutoff -No Int: 3 Hz
Cutoff -Single Int: 5 Hz
Cutoff -Double Int: 15 Hz
FFT Window: Flat Top
Picture File:

CHANNELS CONFIGURATION

Channel 1: Tach
Name: Tach
Range: 0.00 - 5000. RPM
FSV: 20.00
mV/EU: 1000.
Angle: 0
Rotation Direction: CCW
Trigger Voltage: -1.000
Trigger Direction: NEG (-)

Partial Balance Configuration Report

Window Menu

The Windows pull-down menu is directly related to the Windows panel.

Window Menu Selection	Function and/or Comment	Associated Panel Button
Balance Toolkit	Opens the Balance Toolkit window which has tools for performing various weight-related calculations. Note that chapter 4 is devoted solely to the Balance Toolkit and should be referred to for details.	
Machine Graphic	Brings up the Machine Picture window, which allows you to add [or remove] a .jpg or .bmp picture image via its Edit menu. When the add function is selected a window appears, allowing you to browse for, and select, the desired image.	
User Comments	Brings up a window which allows you to enter text. The window is typically used to add project notes.	
Set Password	A password can be used to lock out editing of the results grid. The state of this feature may be saved in the eZ-Balance file such that a project can be configured for locked editing of results and distributed to a testing environment with manual editing disabled. You can open the password dialog directly from the Window pull-menu, or by clicking on the lock icon button [regardless of state]. The "Set Password" entry (in the pull-down menu) is disabled whenever the state of the interface is 'locked,' i.e., red icon condition. **Note**: The default password used, for example in the case of importing legacy files, is '**ZBAL**'. Passwords are case sensitive. New projects use the most recent password; and default to the 'unlocked' state.	 *Unlocked*  *Locked*
eZ-Balance Projects	Brings up a window with a list currently saved projects. You can select a project from the list for post data viewing.	

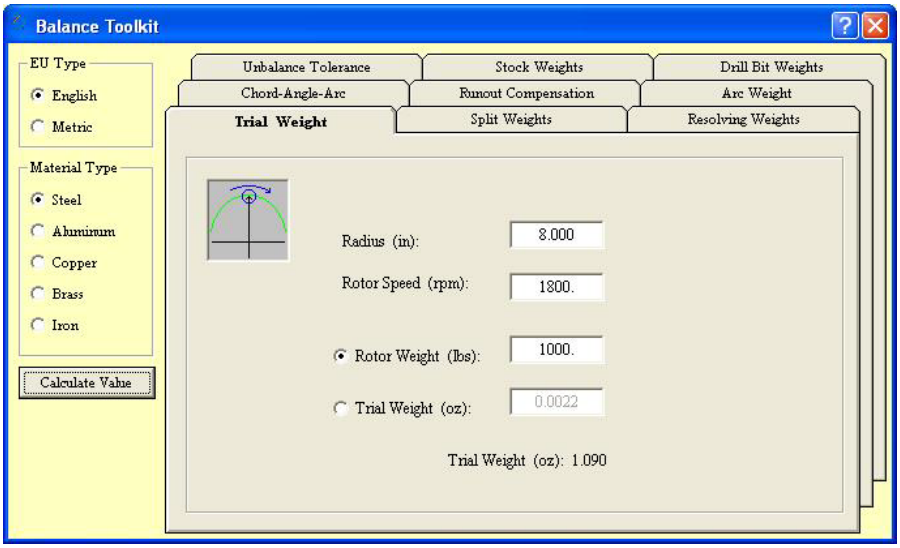
Balance Toolkit 4

The Balance Toolkit provides the means to quickly make a variety of useful balance calculations. To open the toolkit window, select "Balance Toolkit" from the main screen's Window pull-down menu or press the < Balance Toolkit > button. It is the first button in the Window panel.

There are 9 tabs in the Balance Toolkit window (see following figure). Each tab accesses a specific balance calculation. Clicking on an inactive tab brings it to the foreground.

Two panels and a button reside to the left of the tabs. The upper panel is for identifying engineering units as English or Metric. The second panel is for selecting the type of material, e.g., steel, aluminum, etc. The <Calculate Value> button executes the calculation, instantly solving for an unknown variable, or, in some instances, generates a message [likely due to an invalid data entry].

Trial Weight



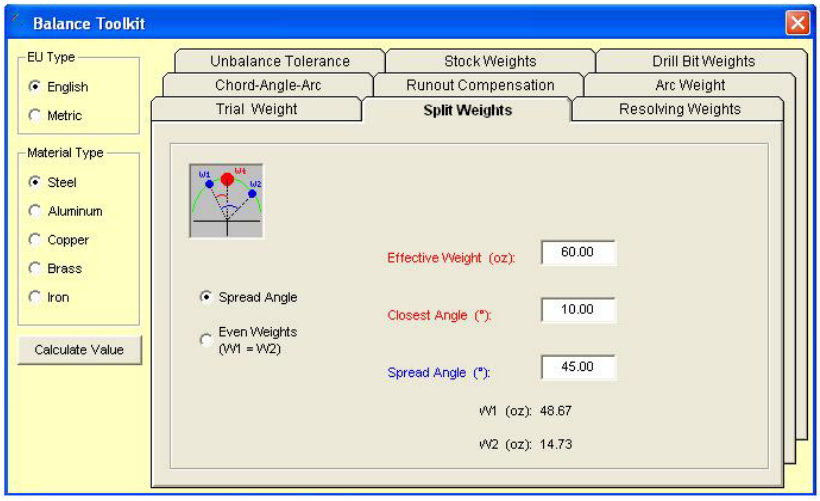
Trial Weight Tab

The Trial Weight tab is used to calculate the weight needed to generate a force equal to 10% of the rotor weight. The Trial Weight can be calculated by entering the rotor radius, rotor weight, speed in RPM; and then clicking the <Calculate Value> button.

You can also use this tab to calculate Centrifugal Force by entering the radius, rotor speed, the trial weight; and then clicking the <Calculate Value> button.

If the rotor is near resonance, a force equal to 10% of the rotor will have too large of an effect. If there is past sensitivity data available, it should be used.

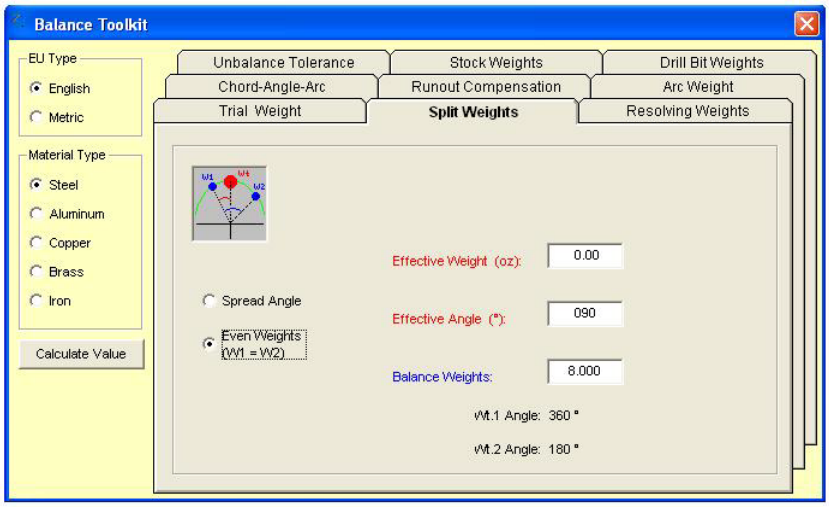
Split Weights



Split Weights Tab – Spread Angle Selected

Find Split Weights. There are times when additional weight is needed at a specific angular location. On some of these occasions there is no adequate mounting location. The Split Weights tab is used to calculate the amount of weight that can be attached at locations other than the one originally intended. The solution weights for the given angles will have the same effect as the original amount of weight.

To calculate split weights: Enter (1) the amount of weight to be added, (2) the angle closest to the original angular position required by your calculations, and (3) the spread angle; (4) click the <Calculate Value> button. The tab will display the two solution weights (W1 and W2).

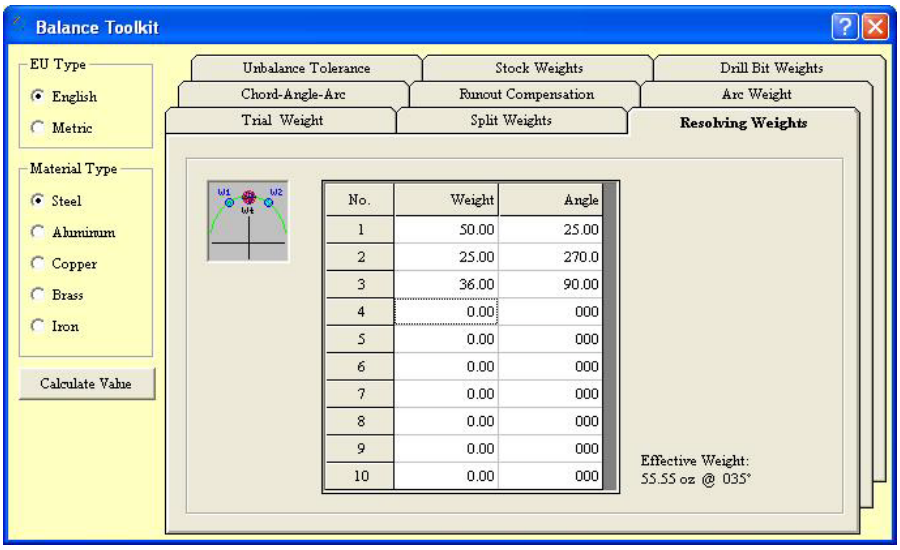


Split Weights Tab – Even Weights* (W1 = W2) *Selected

Find Angles for Even Split Weight Values. This use of this function requires that the additional weights will be identical (W1 = W2). The two solution angles for the given weight will be calculated.

To calculate the angles: Enter (1) the "effective weight", (2) the "Effective Angle" according to the position required by your calculations, and (3) the value of a single "Balanced Weight." Note that W1 + W2 must not be greater than the Effective Weight; (4) click the <Calculate Value> button. The tab will display the two solution angles (*Wt.1 Angle* and *Wt.2 Angle*).

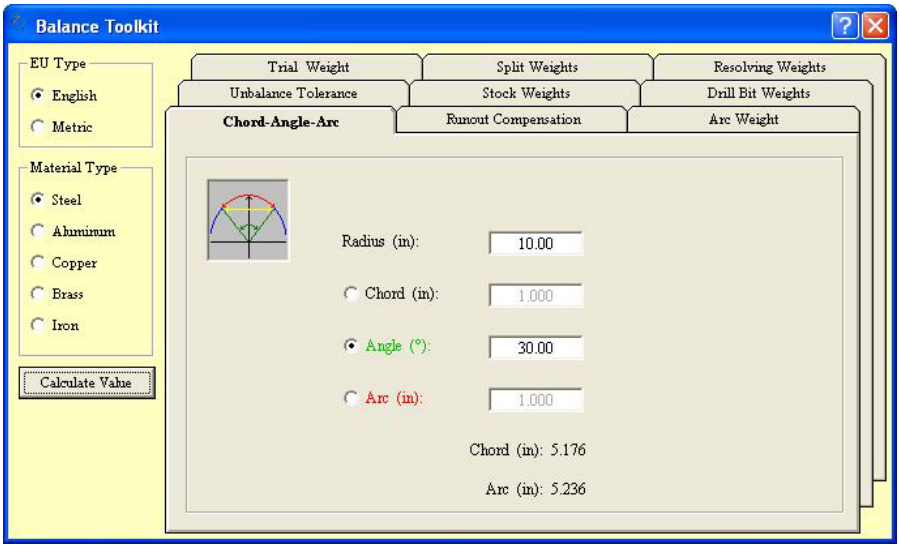
Resolving Weights



Resolving Weights Tab

This tab is used to calculate the effect of placing multiple weights at multiple locations. To obtain the overall effective weight and angle: enter the weight and angular position (in degrees) for each balancing weight; then click the <Calculate Value> button.

Chord-Angle-Arc

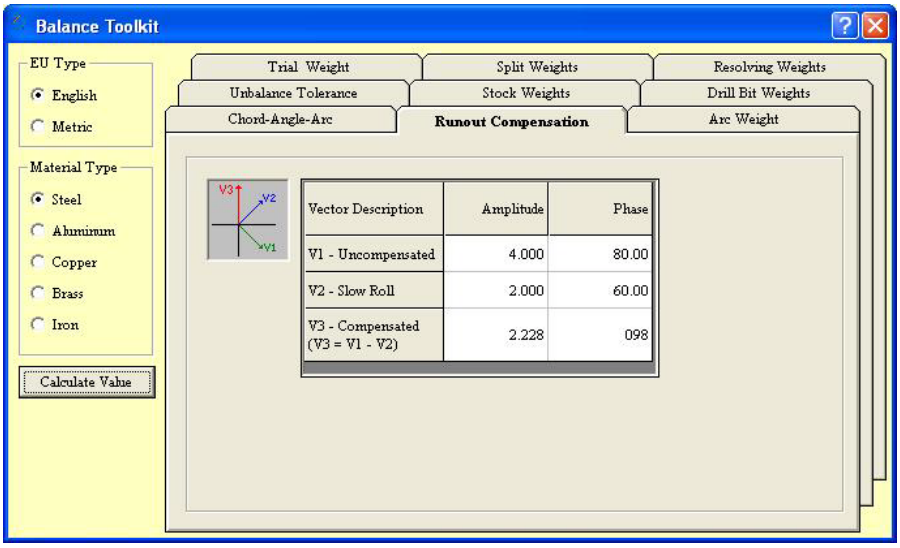


Chord-Angle-Arc Tab

This tab is used to calculate the Chord, Angle, or Arc when the radius and one of three other variables is known.

To make a calculation: (1) enter the radius, (2) click the radio button for the known variable, and then (3) enter the value of the variable. For example, in the preceding figure the angle was known to be 30°. (4) Click the <Calculate Value> button. The tab will display the values of the two remaining variables in the lower center of the screen.

Runout Compensation



Runout Compensation Tab

The Runout Compensation Tab is used to find compensated amplitude and phase. The tab uses vector subtraction; and subtracts the runout measured at low speed from the runout measured at balancing speed.

Runout must be compensated for prior to balancing.

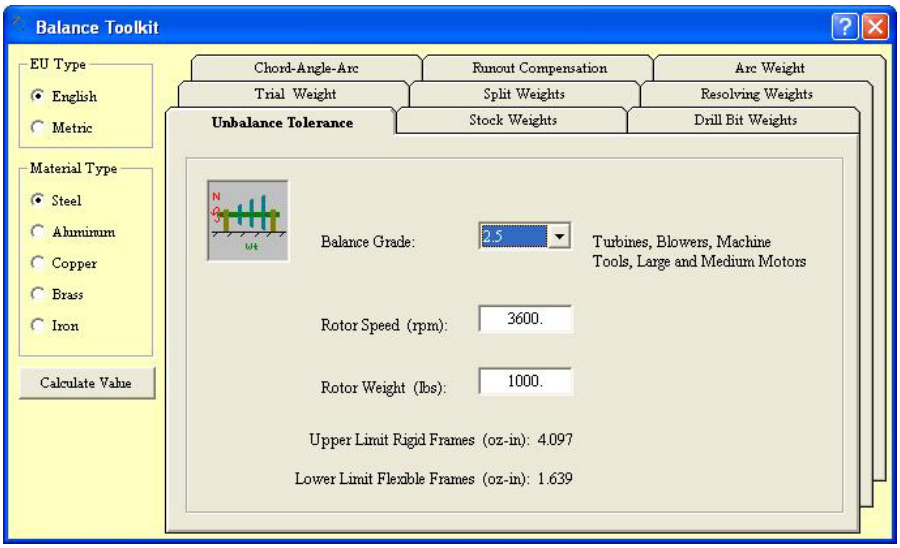
This calculation can also be used to determine the actual amount of vibration that is present in the system.

To make the calculation simply enter the amplitude and phase for balancing speed (V1) and then enter the values for slow roll (V2). Compensated amplitude and phase (V3) are calculated after each data entry.

V1 - V2 = V3

V1 equals the uncompensated amplitude and phase for balancing speed.
V2 equals the amplitude and phase for slow roll.
V3 equals the compensated amplitude and phase.

Unbalance Tolerance



Unbalance Tolerance Tab

This tab is used to calculate the acceptable amount [the tolerance] of residual unbalance.

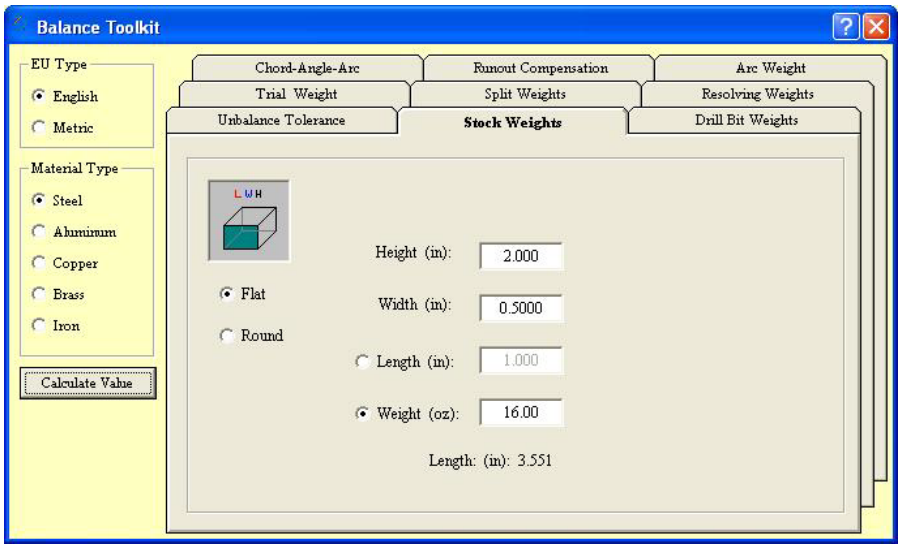
The first step in making the calculation is to select the Balance Grade from the pull-down list. The ISO balance grade standards are presented in the flowing table.

Grade Values and Associated Uses	
ISO Balance Grade No.	**Typically used for the following applications.**
40.0	Car wheels and rims.
16.0	Auto drive shafts, crushing and agricultural equipment.
6.3	Process rotors, centrifuges, fans, flywheels, and pumps.
2.5	Turbines, blowers, machine tools, large and medium motors.
1.0	Jet engines, recorder drives, and grinding machines.
0.4	Armatures and shafts of precision grinding machines.

When a balance grade is selected, the tab displays a list of equipment normally associated with that grade. This is indicated in both the preceding figure and table.

After entering the ISO Balance Grade, enter rotor weight and speed. The Upper Limit for Rigid Frames and the Lower Limit for Flexible Frames will be displayed at the bottom of the window whenever a value [Balance Grade, Rotor Speed, or Rotor Weight] is entered.

Stock Weights



Stock Weights Tab

This tab is used to calculate stock weight, or the length of stock, depending on which variables are known.

For flat stock: Select the radio button labeled "Flat;" then solve for weight or height.

To find weight enter the length, width, and height of the specified stock.

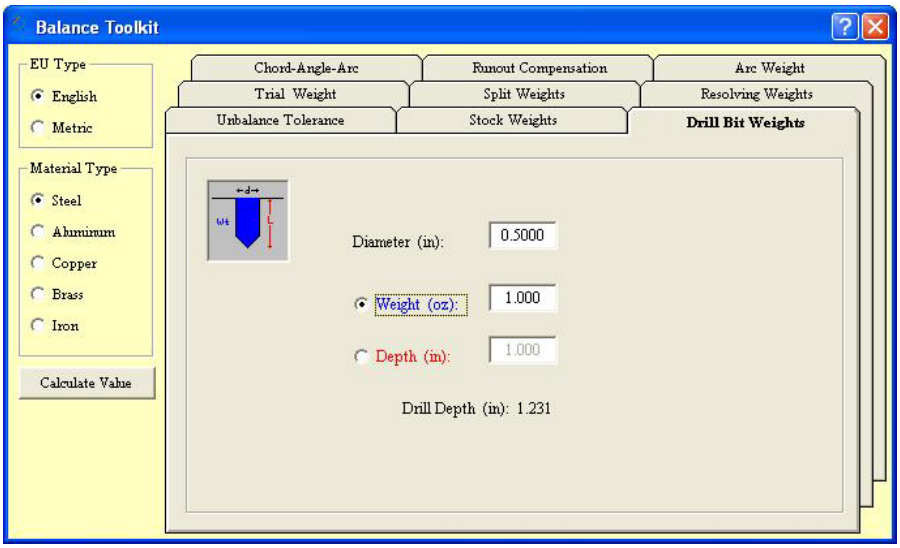
To find length enter the height, width, and weight of the specified stock.

For round stock: Select the radio button labeled "Round;" then solve for weight or height. Note that the tab will change appropriately when solving for round stock, i.e., the graphic will change from a block image to that of a bar, and the height and width fields will be replaced by a single field for diameter.

To find weight enter the diameter and the length the specified stock.

To find length enter diameter and the weight of the specified stock.

Drill Bit Weights



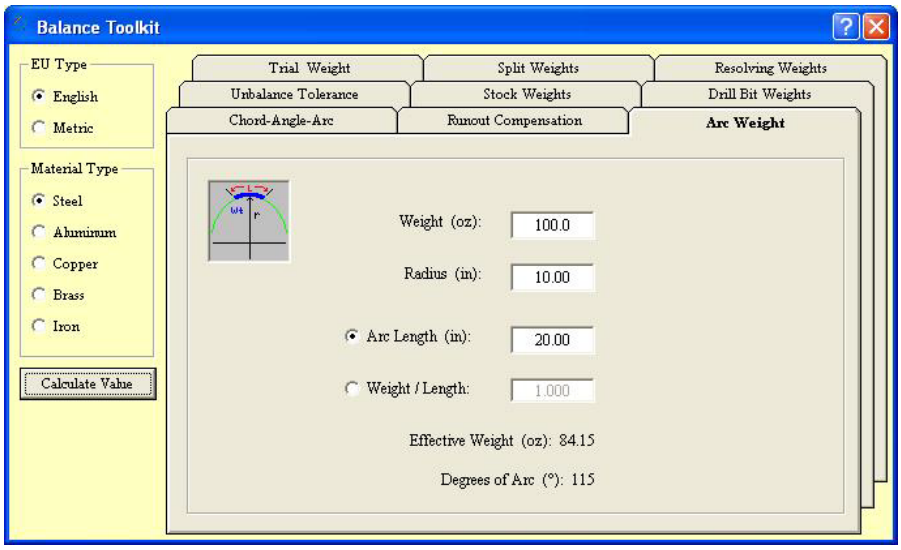
Drill Bit Weights Tab

This tab is used to calculate the drilling depth needed to remove a specified weight of material. It can also be used to calculate the weight that will be removed by drilling to a specified depth.

To calculate drill depth: For the chosen material, such as steel, aluminum, iron, etc.: enter the diameter of the drill bit and the desired amount of weight to be removed. Hit the <Calculate Value> key. The Drill Depth will be displayed.

To calculate weight: For the chosen material, such as steel, aluminum, iron, etc.: enter the diameter of the drill bit and the depth that is to be [or was] drilled. Hit the <Calculate Value> key. The weight will be displayed.

Arc Weight



Arc Weight Tab

This tab can be used to calculate the effect of weight added over an arc. It can also be used to calculate the weight needed to cause a desired effect.

To calculate the effect of weight to be added over an arc: Enter the arc length, weight to be added, added, and the radius. Hit the <Calculate Value> key. *Effective Weight* and *Degrees of Arc* will be displayed.

To calculate the weight needed to cause a desired effect: Enter the weight/length (arc length divided by arc weight), the weight added, and the radius. Hit the <Calculate Value> key. The *Arc length, Arc Weight, and Degrees of Arc* will be displayed.