

**vb**1000b

# **Instrument Reference Guide**

**Revision 10/08/06**

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# Section 1: Introduction

The vb1000b is designed to aid users of rotating equipment, by making balance analysis and manual correction of imbalance fast and easy. Lightweight and extremely portable, the vb1000b is easily carried on site to any problem machine.

This manual has been written and formatted to allow you to quickly and easily learn how to use your vb1000b. Please keep this manual for future reference and read it before operating your vb1000b.

If you have any questions not answered by this manual or would like to make a suggestion, please contact us at our website, [www.commtest.com](http://www.commtest.com).

**Disclaimer:** Although this document makes use of common balancing concepts, it is not intended as a comprehensive guide or training manual. Please ensure you have the relevant knowledge and experience to carry out the procedures described. It is essential to follow all appropriate safety precautions when working near rotating machinery.

---

## Standard Features

- DSP for fast, accurate calculations
- 16-bit A/D converter providing high-precision measurements
- Displacement, velocity, and acceleration measurements
- Frequency measurements
- 512 KB non-volatile memory capable of storing balance data for 200 separate machines/measurements
- 8 MB Flash RAM for spectrum data
- Time and date stamped recordings
- PROFLASH upgradeable firmware
- Temperature-compensated graphical LCD with 240 x 128 pixels and electroluminescent LCD backlight
- 1500 mAh Ni-Cad (Nickel-Cadmium) battery pack
- Battery charger and conditioner
- RS232 interface to communicate with a PC
- Tachometer input for speed and phase measurements
- Two plane balancing

## Standard Kit Items

- vb1000b with protective boot and strap
- Power transformer 13.5 V  $\pm$  1.5 V DC, 1 A output
- Serial data-transfer cable
- USB to serial adapter (BAFO BF-810)
- Accelerometer and cable (ICP<sup>®</sup> type) x 2
- Accelerometer magnetic mounting base x 2
- Instrument Reference Guide
- Warranty card
- QA card
- Carry bag

## Balancing Kit Items

- Non-contact tachometer sensor
- Adjustable tachometer stand with magnetic mount
- Tachometer extension cable (2 meters)
- Reflective tape
- Accelerometer extension cable (5 meters) x 2
- Carry bag

## Instrument Icons



The battery is running low and needs charging.



The large balancing icon is shown at the top left of the Select Machine Menu to indicate that the instrument is in Balancing mode.

The small balancing icon is shown to the right of any memory location that has balancing data saved in it.



Indicates that one or more spectra recordings have been taken on this machine.



In the Select Machine Menu, this icon indicates that the instrument is in Review mode.



In the Select Machine Menu, this icon indicates that the instrument is in Spectrum Recording mode. (This data may be saved).

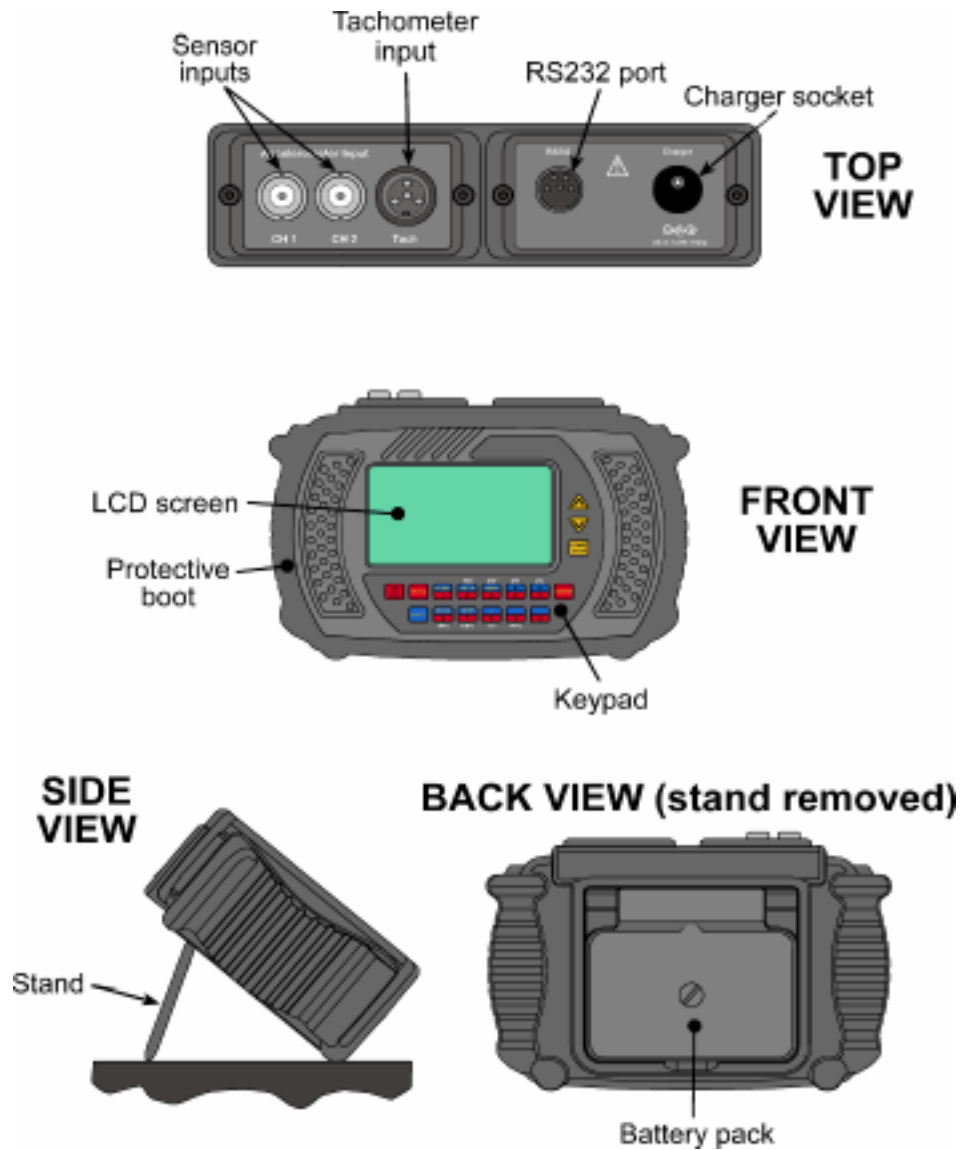


The delta symbol indicates the frequency difference between two peaks on a spectrum.



The instrument is waiting for the hardware to stabilize before taking a measurement.

## Summary of Parts

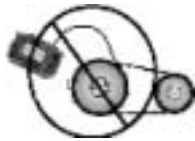


## Precautions

Please read and understand this section before operating your instrument. Heed all warnings and recommendations to prevent data loss, data inaccuracy, damage to the instrument, or injury to yourself.



Do not attach sensors to any object with a high potential voltage i.e. a voltage that exceeds 50 V DC or 32 V AC or the 'safety extra low voltage' (SELV) defined by your local power authority.



Ensure the cables and bootstrap cannot become entangled with any rotating or moving machinery.



Do not bring any objects sensitive to magnetic fields (e.g. cardiac pacemakers, credit cards, floppy disks, video tapes, audio cassette tapes, mechanical watches) near the magnetic mounting bases.



Do not operate the instrument in an explosive environment.



Charge the battery pack up to at least 30% capacity before taking a recording. If using the instrument for 4 hours or more, first ensure that the battery pack is fully charged.

Constantly charging the battery when it is not fully drained will create a 'Memory' effect and eventually shorten the amount of charge that the battery can hold.



Do not detach the battery pack from the instrument for more than 2 hours as data and settings may be lost from the instrument.



Ensure that the battery pack is securely fastened (but not over-tightened) to the instrument before operating.



Transfer data stored in the instrument to a PC before reprogramming the instrument. PROFLASHING the instrument with new firmware may erase all data stored in the instrument.



When using an ICP<sup>®</sup> type accelerometer, ensure that the drive current is turned on otherwise the measurements will be incorrect.



Mount the sensor properly before taking measurements or recordings. Otherwise, the data will be incorrect and/or inconsistent.



To clean the instrument use a mild detergent diluted in warm water. Do not use abrasive or polishing substances, hydrocarbons, petrochemicals or solvents as they degrade the plastic.



Do not place the vb instrument or the magnetic mounting base in a hot place where the temperature exceeds 140 °F (60 °C). Otherwise, the battery pack or magnet will degrade.



Although the instrument has a rugged construction, do not expose it to wet conditions or store it in a damp place where the relative humidity exceeds 95%.



If the instrument malfunctions, return it to an authorized dealer. Do not attempt to repair the instrument yourself, as this will invalidate the warranty.



Use only an approved instrument power transformer (13.5 V  $\pm$  1.5 V DC, 1 A output, center positive) and ensure its voltage and frequency rating matches that of your mains AC power.

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## Section 2: Basic Operation


This section describes how to perform basic operations on your instrument.

You will learn to:

- Power up the instrument
- Navigate through initial screens
- Select an option
- Create a machine
- Enter and edit text/numbers
- Set up sensors

**Caution: Read Section 1: Precautions before operating your instrument.**

## Powering Up

- Press the  key to power up the instrument or turn it off.

The following screen is displayed at power up. The displayed firmware version and creation date will reflect the currently installed firmware in your instrument. Updated firmware versions can be downloaded from [www.commtest.com](http://www.commtest.com).

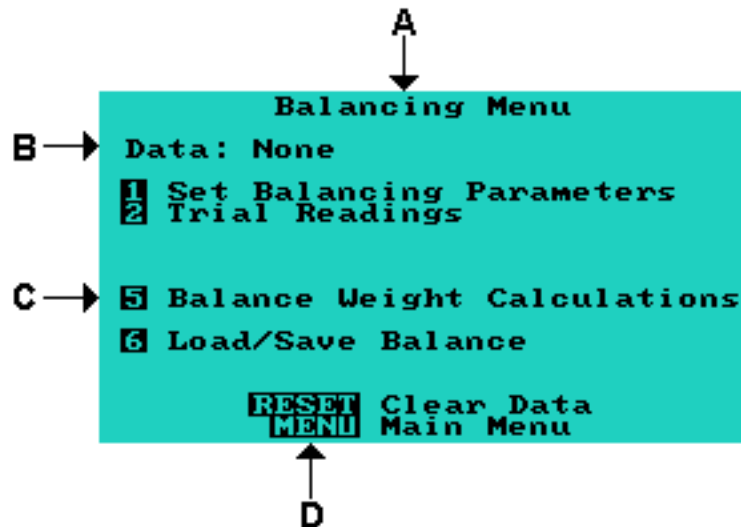




After five seconds the power up screen will be replaced by the Main Menu of the instrument.




- To bypass the power up screen press .

## Menu Navigation

Most menus found on the instrument follow a standard format, making navigation easy and intuitive. The following describes the components of a typical menu.




- A** The menu title is displayed at the top of each screen.
- B** Data: This label will be found on most screens within both the Monitor Vibration and Balancing Menus. It indicates the name of the machine you are currently working with. A value of 'None' indicates that no machine is currently selected.
- C** Navigation of all menus is accomplished by pressing the number key corresponding to the number beside the menu item e.g. pressing  will display the Balance Weight Calculations Menu.
- D** Pressing the  key always returns you to the previous menu. Key prompts e.g. RESET in the example above, are displayed at the bottom of each menu as needed.


Pressing and holding down the  key together with a number key will access the function labeled on the **upper** command of that key e.g. pressing  +  allows you to toggle the LCD backlight on and off.


## Main Menu


The Main Menu provides access to the instrument's main operational tasks.




To access this menu, press  once or twice depending on your location.

 **Monitor Vibration Menu** - Used to assess and record vibration and imbalance levels, not to perform balance jobs. You can save both balance and spectrum measurements to named memory locations for later retrieval.




 **Balancing Menu** - Used to perform balance jobs and the same balance measurement functions as the Monitor Vibration Menu. Spectral measurements are not taken under this menu.

 **Balance Reports** - Used to send a listing of balancing readings to a PC via the RS232 serial data transfer cable.

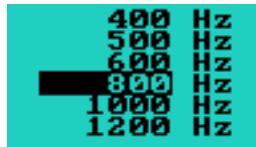
 **Utilities** - Allows you to set the date/time, manage the vb battery and erase any stored data.

## Selecting an Option

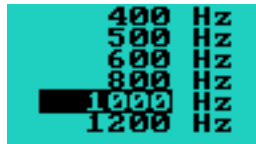
- Press the numbered key that corresponds to the option wanted.


You may need to press  or  to highlight the option, then press  to select the option.

For example, to select a frequency maximum of 1000:



- Press  to scroll down and highlight this option.



- Press  to select this option.

## Creating a Machine

Machines can be named and saved in a memory location either before data is collected or once measurements have been taken.

- From the Main Menu, press **RESET** **1** to display the Monitor Vibration Menu or **HELP** **2** to display the Balancing Menu.
- From either menu, select Load/Save Balance by pressing the appropriately numbered key.

The Select Machine Menu displays a list of numbered memory locations (1 to 200).

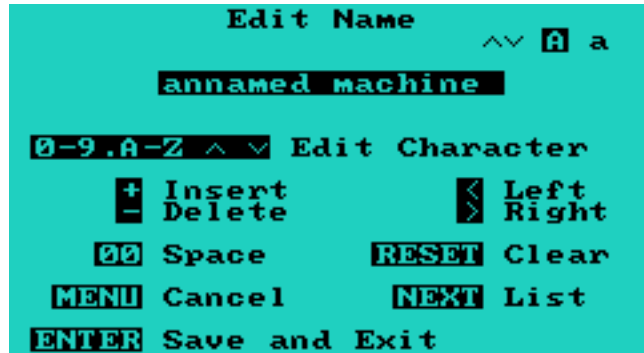


The options available in this menu will be fully explained later in this manual (see Section 4: Load/Save Balance).

- To name a machine, press **HELP** **2** to display the Edit Name Menu.
- Enter the required name by following the on-screen editing instructions, which are covered next.

## Entering Text and Numbers

To enter text or numbers press the corresponding number/character key. As with a mobile phone, the character options for each key are displayed with subsequent key presses (e.g. the first press of the '3' key displays '3', the second press displays 'D', the next press displays 'E' etc). The cursor will advance automatically after a short pause so that the next character can be entered.



Names can be up to 16 characters long in upper or lower case. To enter or edit names:

- Press the key that has the required characters displayed above it until the correct character appears above the flashing cursor.

### Example:

To enter the word FAN





- Press  four times until the F displays.



The cursor advances automatically after a short pause.

- To enter the letter A, press  twice until the A displays.




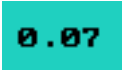



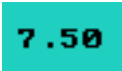

- Press  three times to display an N.  

- Press  twice to enter a space between words if required.
- Press  to save when you have finished entering or editing your text.

## Entering Numerical Values

















To enter numerical values press the appropriate number key. It is not necessary to enter decimal points as they are placed automatically.

### Example:

To enter the value 7.5

- Press  > 
- Press  > 
- Press  > 
- To clear an incorrect entry press  until the value is reset to zero.

## Other Name Editing Commands

-  Cancels the current edit screen and retains the original name.
-   Moves the cursor forward.
-   Moves the cursor backward.
-   Inserts a 0 at the current cursor position or deletes the character at the cursor position.
-   Inserts a space at the current position.
-   Deletes the character at the current position.
-   Clears all the characters to the right of the cursor.
-  Changes the currently selected letter to uppercase if it is currently lowercase.
-  Changes the currently selected letter to lowercase if it is currently uppercase.
-  Scrolls through the various symbols if the cursor is in a space.

## Supported Sensor Types

The instrument can take measurements using a wide range of sensors. The sensitivities and types of measurement that can be taken by each sensor are summarized in the following table.

Sensor Type	Measurement Types	Sensitivity
<b>Accelerometer</b>	Acceleration Velocity Displacement	mV/g 8.5-2300
<b>Velocity Sensor</b>	Velocity	mV/in/s 8.5-2300 mV/mm/s 0.34-90.55
<b>Displacement Sensor (or prox probe)</b>	Displacement	mV/mil 8.5-2300 mV/ $\mu$ m 0.34-90.55

### Invalid Combinations

When you set the parameters for a measurement you cannot choose settings that conflict with the type of measurement you are trying to create e.g. if you are measuring velocity you cannot select a displacement sensor. If you try to take the measurement the instrument will display an 'Invalid Combination' message and no measurement will be taken.



## Accelerometer Setup

Plug the accelerometer connector into the CH1 input on the instrument (For 2-plane balancing, plug a second sensor into CH2).

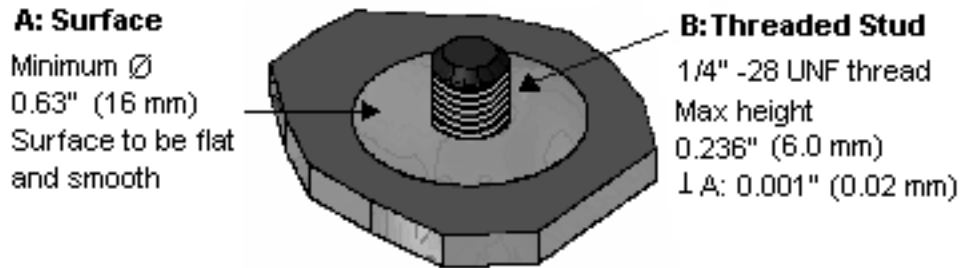
Screw the accelerometer into the magnetic base and attach to the measurement point ensuring it is:

- Attached to a sturdy, rigidly mounted and non-flexible structure, where vibration from the rotating part of the machine will be accurately transmitted. Avoid attachment to sheet metal, guards, or any machine structure which is not closely coupled to the source of vibration in the spinning rotor as the vibration of such a structure will be different to the vibration source.
- Attached to a structure which is at least 10 times heavier than the sensor itself. Do not mount the accelerometer on lightweight motors or similar parts, as the weight of the accelerometer will distort the vibration signal.
- Attached as closely as possible to, and in line with, the centerline of the bearings to avoid distorted signals.
- Oriented correctly (horizontal and vertical planes), as vibration in one direction can vary from vibration in another direction.
- Attached to exactly the same spot as prior measurements if data is to be used as part of an ongoing study or comparison.
- Securely attached to the mounting surface. The surface should be flat and smooth where the sensor makes contact. Attachment can be either via the supplied magnetic accelerometer base, or via a threaded stud on the machine surface.

## Permanent Mounting

To mount using the stud method, prepare a mounting spot on the machine following the specifications shown in the diagram.

- Unscrew the magnetic base from the accelerometer and screw onto the threaded stud. Use of thread locking compound is suggested.



*Stud Mounting Spot*

**Caution:** Do **not** use a wrench to tighten the accelerometer as this will damage the sensor.

## Tachometer Setup

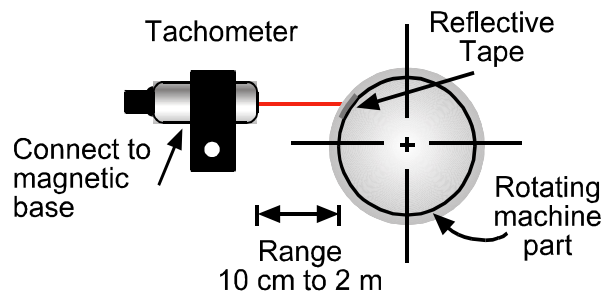
The tachometer provides the instrument with information on the speed of rotation and the angle at which the rotor is vibrating. The angle is measured from a fixed reference mark on the rotor and is called the 'phase angle'. To balance a rotor, it is necessary to consider not just the amplitude of vibration but also the phase angle. The amplitude shows the severity of the imbalance and the phase angle indicates the geometry of the imbalance.

**Note:** When using the tachometer, the highest Fmax that can be displayed is 1000 Hz (60 000 CPM).

To set up the laser tachometer:

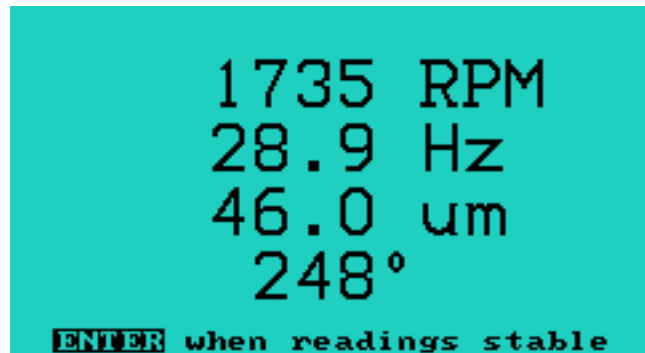
- Locate the drill hole in the tachometer and screw this onto the end of the mounting base movable arm.
- Plug the cable socket into the tachometer connecting pins then turn the locking ring to make a secure connection.

- Locate the tachometer input on the instrument and attach the other end of the cable to this.
- Stop the rotor.
- Cut out a small strip of the supplied reflective tape, approximately 5 mm x 15 mm (0.2" x 0.5").
- Stick the reflective tape to a machine part that rotates at the rotor speed e.g. the shaft. This trigger spot should provide a pronounced increase in reflection as it passes under the tachometer light beam. The tape width must be **at least** double the diameter of the light beam spot.
- Mount the tachometer magnetic base to a stationary portion of the machine, convenient to the trigger spot.
- Position the sensor slightly away from the centerline of the rotating machine part in order that it is not 'blinded' by reflections from the surface of the machine part. The sensor should be positioned within the measurement range shown in the following diagram.



**Warning:** The laser tachometer is a class 2 laser product. Do **not** stare into laser beam.

- Start the rotor and wait till it is at normal running speed.
- Now test if the tach will trigger. From the Main Menu press **RESET** **1** Monitor Vibration, then **LIGHT** **3** Measure Balance.
- Press **ENTER** to display the running values screen.



- Ensure a stable RPM is displayed on the LCD screen. This indicates that the tach is triggering reliably. If the RPM does not stabilize, adjust the position of the sensor.
- To return to the Main Menu, press **ENTER** and **MENU**.

## Section 3: Monitor Vibration

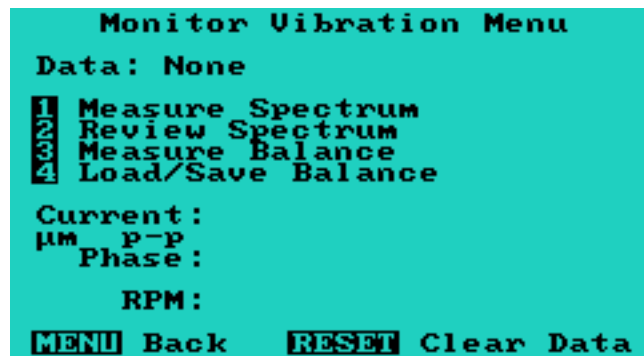
This section describes the functions available under the Monitor Vibration Menu.

You will learn to:

- Record a vibration spectrum
- Review a vibration spectrum
- Take a balance measurement
- Manually enter an RPM value

## Monitor Vibration Menu

The Monitor Vibration Menu is accessed from the Main Menu. It permits quick measurement of vibration and imbalance levels on a machine, and allows you to save this data to named memory locations. The menu includes the following elements.




### Current: (values)

This section of the screen displays the results of the most recent measurement. Vibration level is displayed to the right of the word Current. The current vibration units are displayed below. The Phase angle and RPM level of the last measurement is displayed below this. Note that the phase angle will only be listed if the measurement was taken with a tachometer. It will not be shown if the RPM was entered manually.

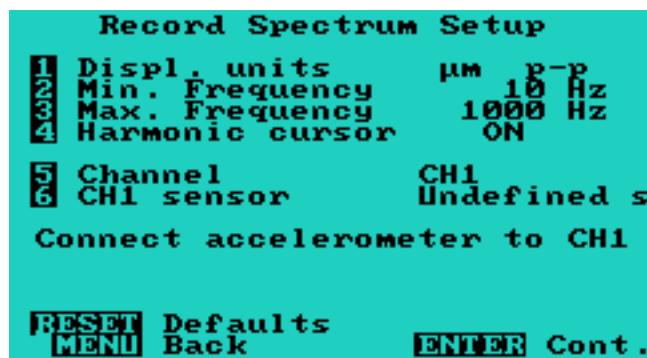
In the previous screen, the vibration units are displayed ( $\mu\text{m p-p}$ ), but no values are shown for Vibration, Phase or RPM because a measurement has not yet been taken (see this section: Set Balancing Parameters for details of available vibration units).

# 1. Measure Spectrum

This Menu is used to view and record spectra. If you are getting unexpected balancing results, you can record a spectrum to look for interfering vibration or other fault symptoms.

- To perform a vibration measurement, select  Measure Spectrum, from the Monitor Vibration Menu.

The Record Spectrum Setup Menu is displayed. This menu allows you to set the parameters for the vibration measurement.





**Displ. units** - Allows you to measure vibration using displacement, velocity or acceleration. From this menu you can change the unit and amplitude type.



**Min. Frequency** - Allows you to set the Fmin. The minimum allowable Fmin is 300 CPM (5 Hz). This setting causes the spectral lines below this frequency to be 'zeroed out'. This will remove any ski-slope or other undesirable low frequency effects.



**Max. Frequency** - Allows you to set the Fmax. The maximum allowable Fmax is 72 000 CPM (1200 Hz).






**Harmonic cursor** - Toggles the harmonic cursor displayed on the spectrum ON or OFF.



**Channel** - Toggles the channel between CH1 and CH2 on the instrument.



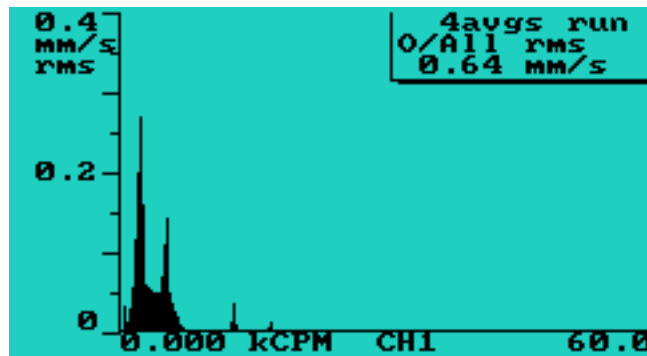
**CH1 sensor** - Allows you to select a different sensor to take the measurement. From this menu you can name a sensor and change its settings (settling time, sensitivity etc). Up to 16 sensors can be stored in the instrument.

- To toggle the display between CPM and Hz, press  to display the Set f max screen then  to change the units.
- Once connected and the machine is running at speed, press  to begin measuring.

The following screen is displayed while measuring.



Once this message clears, a vibration measurement will be taken and the resulting spectrum displayed on the screen.



- Press **ENTER** to save the spectrum.

In the Save Spectrum Menu, select a machine (or press **HELP** **2** to create a name if it is a new machine) then press **ENTER** to save the new recording.



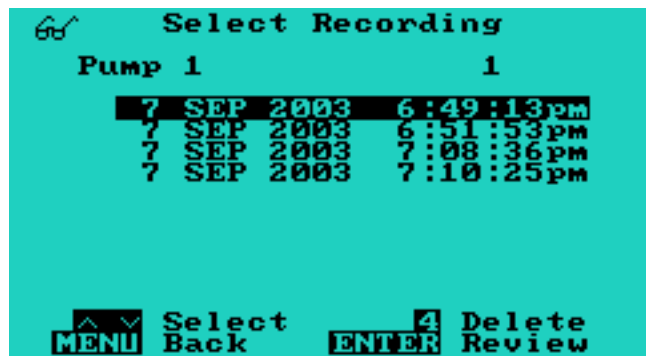
## 2. Review Spectrum




- To review a spectrum, press  2 Review Spectrum, from the Monitor Vibration Menu.
























- Select the machine using the   arrow keys and press .

The displayed menu will show you the list of recordings taken for this machine.




- Select the recording you want to review using the   arrow keys and press  to display the spectrum.

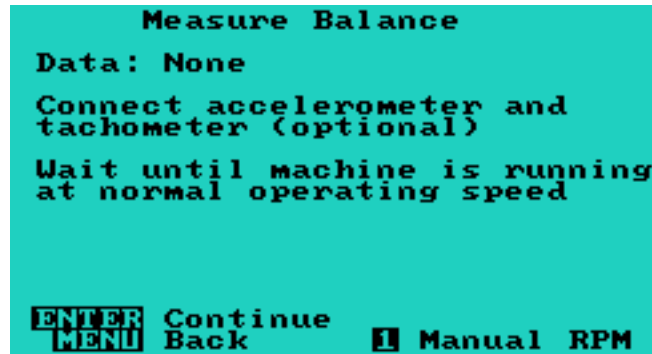
Spectra can be analyzed in the following ways:

- To read the vibration amplitude corresponding to a particular frequency, press  or  to move the cursor to that frequency value. The values indicated by the cursor are displayed at the top of the screen. To move the cursor rapidly, press  +  and  + .
- To identify the harmonics of a peak, move the cursor to the peak of interest. If the harmonic cursors option has been turned on additional cursors are displayed at frequency values that are whole-number multiples of the frequency value indicated by the main cursor.
- To display the frequency difference between two peaks, press  or  to position the main cursor at one of the peaks. Press  then  to anchor a datum cursor at the peak. Press  or  to position the main cursor at the other peak. The frequency difference between the two peaks will be displayed at the top of the screen. To clear the datum cursor, move the main cursor to where the datum cursor is and then press  then  again (or press  then  twice if not on the datum cursor).
- To take a close-up view of a spectrum, move the cursor to the position of interest and press  then  to zoom in by a factor of 2. To zoom out (by a factor of 2), press  then .
- To view the spectrum measured on the other channel press . The currently displayed channel is indicated at the bottom of the screen; by default channel 1 is displayed.


### 3. Measure Balance

- To take a quick preview of the imbalance level press  Measure Balance, from the Monitor Vibration Menu.

An instruction screen is displayed, indicating the need to connect the vibration sensor and optional tachometer before measuring.

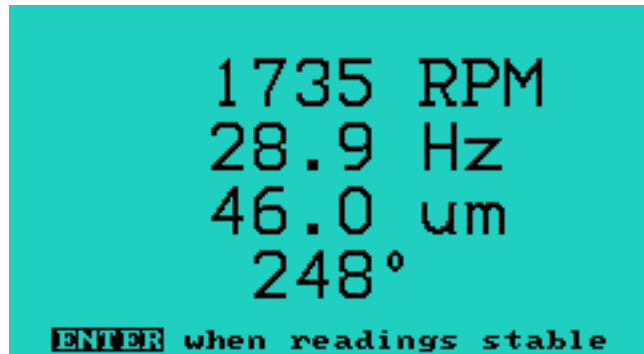


Using the tachometer is optional when simply monitoring balance levels. You can choose to manually enter the RPM (where known) of the equipment being measured, instead of using the tachometer (see Manual RPM for details). Note: You need to use **either** the tachometer **or** set the RPM manually in order to record vibration.


- Once the sensor is connected and the machine is running at speed, press  to begin measuring.

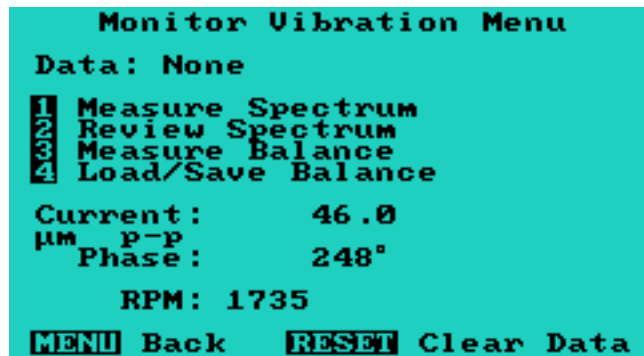
## Running Values Screen

The following screen is displayed while measuring. A 'Hardware is stabilizing' message will appear at the bottom of the screen for a few seconds. Once this message clears, the screen reads as shown.



If no tachometer is connected the screen will display a 'no tach signal' message. Connect the tachometer and continue.



- When the values are relatively stable, press  to record these values to current memory.



This will complete the measurement and return you to the Monitor Vibration Menu. The current values will now reflect the updated measurement.

## Manual RPM

To simply measure vibration levels, you can choose not to setup and use the tachometer if the running speed of the machine is already known from prior measurements. If Balancing operations are going to be performed, it will be necessary to use the tachometer.

- From the Measure Balance Menu, select  Manual RPM to allow manual input of an RPM number.
- Use the number keys to enter the desired RPM level on the following screen, and press  to continue.



## 4. Load/Save Balance

The functions available on this Menu are also available under the Balancing Menu. Please refer to Section 4: Load/Save Balance for details.

## Section 4: Balancing

This section describes the procedures for performing balancing operations on your instrument.

You will learn to:

- Understand the balancing process
- Set balancing parameters
- Perform trial readings
- Perform balancing
- Review balance readings
- Use balance weight calculations
- Load, save, edit and delete data in the vb memory
- Produce balance reports

---

## Introduction

The instrument can be used to balance rotors that are rigid but **not** rotors that flex significantly at their operating speeds.

An imbalanced rotor is one that has an uneven mass distribution that causes the rotor to vibrate when it is rotated. Balancing a rotor means correcting the uneven mass distribution by adding or removing weight to/from precisely calculated positions on the rotor.

A rigid rotor can be balanced in one plane or two planes i.e. any uneven mass distribution in the rotor can be corrected by adding/removing weights to/from one or two selected cross-sectional planes on the rotor.

For single plane balancing, the mid plane of the rotor is usually used as the balancing plane. For dual plane balancing, usually the planes at the extreme ends of the rotor are used, however, other planes on the rotor can be used also.

Since the effect of a rotating weight (i.e. the centrifugal force) increases with the radial distance of the weight, it is common to add weight to, or remove weight from, the rim of the rotor rather than a position close to the centre of rotation. By making weight adjustments at the largest possible radial distance, the amount of weight that needs to be added to, or removed from, the rotor can be minimized.

The centrifugal force of a heavy spot on the rotor that causes the rotor to vibrate increases with the square of the rotational speed. The vibration level of the rotor may be acceptable at one speed but not at another. It is thus important to always allow the rotor to settle to its normal operating speed before taking balancing analysis measurements.

Whether a rotor should be balanced in one plane or two planes depends on the dimensions and operating speed of the rotor. The following guideline is commonly used:

Rotor Length to Diameter Ratio	Operating Speed	Balancing Technique
0.5 or less	1000 RPM or less	Single plane balancing
	More than 1000 RPM	Dual plane balancing
More than 0.5	150 RPM or less	Single plane balancing
	More than 150 RPM	Dual plane balancing

**Note:** Before attempting to balance a rotor, confirm that the cause of vibration is uneven mass distribution in the rotor. Good balancing results can be obtained only if vibration is caused by uneven rotor mass distribution. Attempting to balance a rotor with other problems will not, in general, reduce the vibration level.

## The Balancing Process

A rigid rotor can be balanced in one or two planes. The following steps are involved:

**Setting Balancing Parameters** - Select units and balancing method.

**Initial Reading** - A measurement of the imbalance is taken.

**Trial Weight Reading** - A trial weight is attached to the balancing plane and another measurement is taken. For dual plane balancing, the same is also done for the second plane.

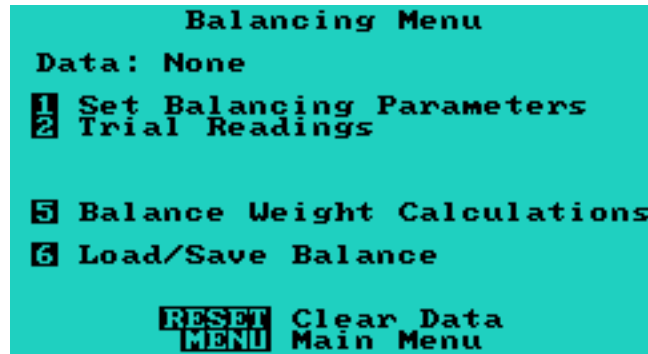
**Balancing** - Correction weights are attached to the balancing plane(s) as recommended by the instrument.

**Trim Balance** - A measurement is taken in each plane to confirm that the rotor is balanced. Any residual imbalance can be removed via additional trim balance cycles.

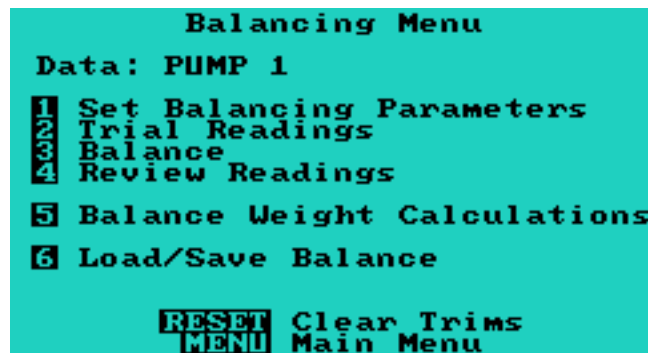
## The Balancing Menu

The Balancing Menu is accessed from the Main Menu. This menu gives you the same ability to take balancing measurements as the Monitor Vibration Menu and also to perform balancing jobs.



After initial and trial recordings have been taken, the Balancing Menu updates to give you options to balance and review readings.



*Example of Balancing Menu with no recordings taken*

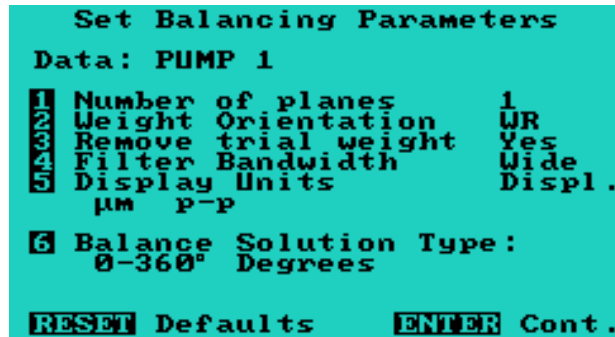


*Example of Balancing Menu with recordings*

Pressing  +  from this menu clears the current measurement data in a three stage process. The first press clears the trim balance readings. The second press removes both initial and trial weight readings. The third press will clear the data name which is then reset to display 'None'.

# 1. Set Balancing Parameters

Selecting this option allows you to select the appropriate parameters to be used for the balance operation.



## Number of Planes

Toggles the number of balance planes between 1 and 2. One plane will be used for explanation in this manual, but the same principles and screens will apply for two plane balancing.

## Weight Orientation

A sub-menu allows you to select the scale direction used to position balance weights on the equipment being balanced, relative to the rotation direction of the rotor. The choices are:



**AR** (Against Rotation) - Balance weights are positioned on a scale which runs in the **opposite direction** to the machine rotation.

**WR** (With Rotation) - Balance weights are positioned on a scale which runs in the **same direction** as the machine rotation.

Ensure that with the rotor stationary, you *measure angles in the direction specified*. Do **not** rotate the rotor in the direction specified.

---

## Weight Position Reference System

Performing balancing operations on a rotating body depends on a user establishing a positioning system for balance weights. The more accurately this reference system is established, the more accurate balancing operations will be. To create your position reference system choose either of these options:

- Mark an angle scale on the rotating body from 0 to 359 degrees and determine a fixed radius from the center of rotation where balance weights can be added or positioned anywhere on the radius (e.g. sliding weights). Such an angle scale is also needed for single point balance solutions where you will add or remove weight from a single point at a given angle.
- Establish a fixed number of attachment points (e.g. drilled and tapped holes) that are equally spaced on a fixed radius from the center of the rotation.

## Remove Trial Weight

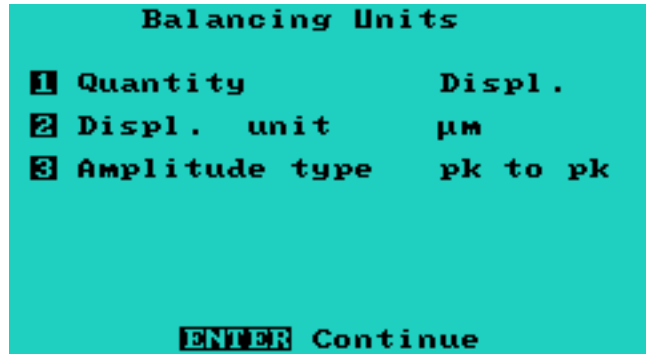
Toggles whether the trial balance weight will be removed from the machine after the trial balance reading (yes/no). When performing a two-plane balance with 'Remove trial weight' set to Yes, the trial weight from the first trial must be removed **before** performing the second trial.

## Filter Bandwidth

Selects WIDE or NARROW filter bandwidth for vibration measurement. Wide setting allows better stability, and should be used except where background sources of vibration noise exist very close to the frequency (within 150 RPM) of the rotating equipment being balanced.

## Display Units

This screen is accessed from the Set Balancing Parameters Menu and allows you to select different balancing units.

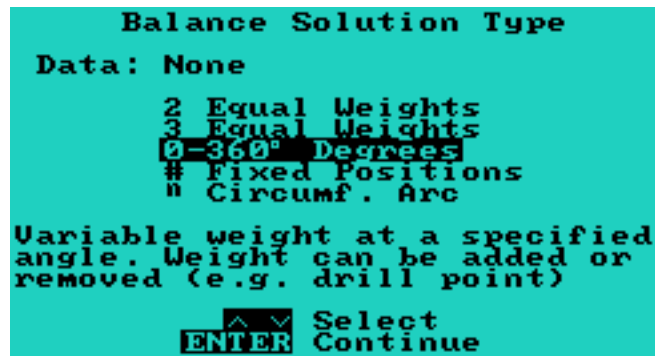


Units available are: (press the appropriate number key to toggle settings)

<b>RESET</b> 1 <b>Quantity</b>	Displacement	Velocity	Acceleration
<b>HELP</b> 2 <b>Units</b>	μm, mm, mil	mm/s, in/s	g, m/s <sup>2</sup>
<b>LIGHT</b> 3 <b>Amplitude</b>	peak-peak, RMS, Ø-peak		

## Balance Solution Type

Selects one of five methods of adding or removing weight to the rotor when performing balancing. The current setting is displayed on the Set Balancing Parameters Menu.



- 2 Equal Weights** Two equal weights will be used, and positioned at variable angles, e.g. sliding weights.
- 3 Equal Weights** Three equal weights will be used, and positioned at variable angles, e.g. sliding weights.
- 0-360 ° Degrees** A single, variable amount of weight will be positioned at an angle specified by the instrument. An alternative exists to remove the same weight from a position spaced 180°, e.g. by drilling out material.
- Fixed Positions** Variable amounts of weight will be added to equally spaced, predetermined positions, such as a bolt circle of drilled and tapped holes. The number of fixed positions can be set from 3 to 99.
- Circumf. Arc** The linear distance around the outside of the rotor will be measured from the reference mark to the weight.


### *Equal weights/Sliding weights*

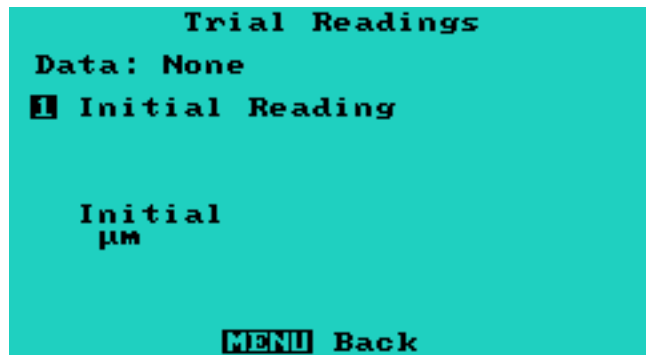
Sliding weights are usually used only for specialized rotors that have a purpose made groove near their outer circumference. Two or three equal sized weights slide along the groove and can be locked in place. The groove is often pre-marked in degrees. For this style of balancing, the initial reading is performed with all weights removed and the trial reading is performed with **one** weight fitted at the 0° location.

The different solution types will use the same basic screens and steps in balancing, but the detail of some screens will vary to convey different information.

## 2. Trial Readings

The Trial Readings Menu is used to prepare the rotor to be balanced.


- Press  from the Balancing Menu to display the Trial Readings Menu.



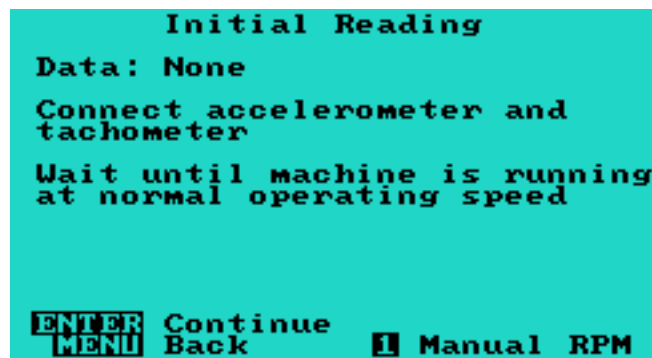
This menu accesses both the Initial Reading and Trial Reading functions. Before taking an initial measurement or loading values from a saved memory location, the screen will appear as shown with only one menu choice, Initial Reading.

## Initial Reading


An initial reading is taken to determine the imbalance level before performing any balancing procedures.

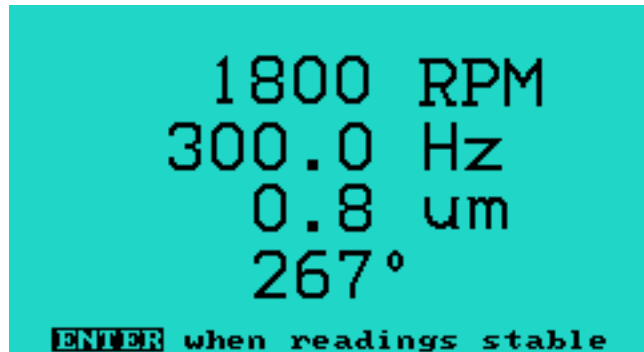
- Press  to perform an initial measurement of imbalance, which defines the starting point of the balancing procedure.

An instruction screen is displayed, indicating the need to connect the vibration sensor and tachometer, and bring the machine to normal operating speed before conducting the measurement.



**Note:** When balancing, unlike monitoring vibration, the tachometer is required. Manual RPM entry is not possible when balancing. The Manual RPM Entry Menu is made available from this menu so users can choose to perform quick balance level checks on equipment, without setting up the tachometer (equivalent to the Monitor Vibration Menu). However, you will be required to retake the initial reading with the tachometer in order to proceed to the next balance step: trial weight reading.

- Press  and wait for the Initial measurement to be displayed in RPM, Hz, mm/s, and degrees.



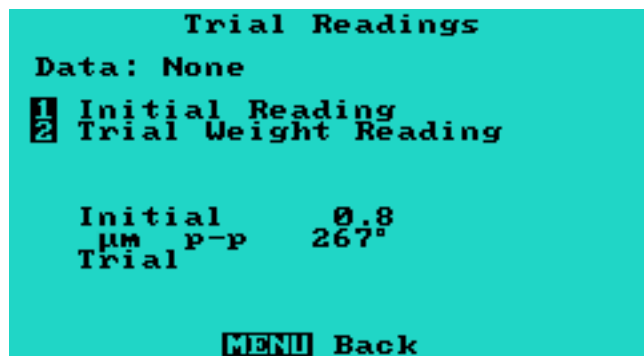
- When the readings are stable, press  to record values.

The Trial Readings Menu will again be displayed, but an additional menu option is now available - Trial Weight Reading.

## Trial Weight Reading

Trial weights are used to provide a starting reference for the instrument in determining how much weight to add or remove to balance a rotor. The Trial Weight Reading Menu is where the trial weight mass and location are set.

Your trial weight must be of a sufficient mass to change the rotor imbalance so that the instrument can perform its calculations accurately (the industry norm is approximately 30% change in amplitude or 30° in phase). If in doubt use the Suggest Trial Weight Calculator (see Section 4: Suggest Trial Weight).



- Stop the machine rotation and press **HELP** **2** to proceed to the Trial Weight Reading.

```
Trial Weight Reading
Data: None
1 Trial weight mass      1.00
2 Trial weight angle    0°
Connect tachometer, trial
weight and accelerometer
Wait until machine is running
at normal operating speed

ENTER Continue
MENU  Back
```

The previous screen shows the factory default values for trial weight mass (1.00) and angle (0°). This will vary depending on the solution type chosen.


- Enter your own trial weight mass by pressing **RESET** **1** to display the Enter Trial Weight Menu, then using the number keys to enter a value. Continue or cancel by pressing the keys shown on the screen.

```
Enter Trial Weight

      2.00

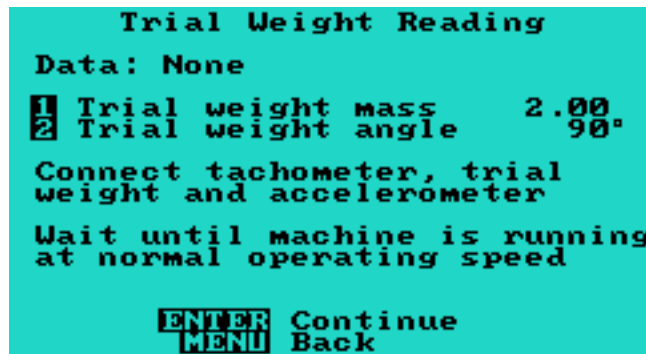
For larger values, scale the
implied units, eg. for 260g,
enter 0.26kg

0-9  0.00 - 255.99
MENU Cancel
ENTER Continue
```

- Enter your own trial weight angle by pressing  from the Trial Weight Reading Menu. Use the number keys to enter a value then continue or cancel by pressing the keys shown on the screen.



The Trial Weight Reading Menu now displays the new trial weight mass and angle.

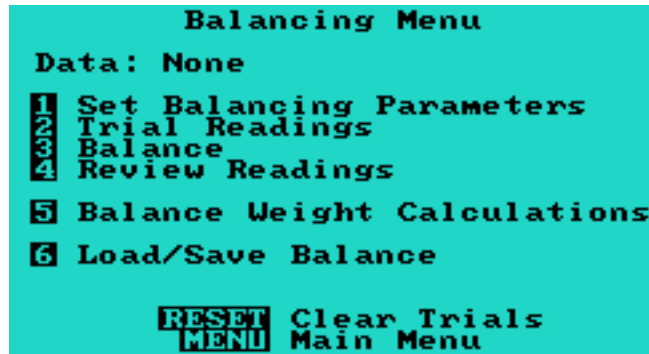


- Attach a trial balance weight at the indicated position and restart machine rotation.

The position of the trial weight (in this case 90°), will define the zero reference point used for subsequent balance calculations. All subsequent instructions to position weights will be relative to this zero point.

- Press **MENU** to exit the Trial Readings Menu and return to the Balancing Menu.

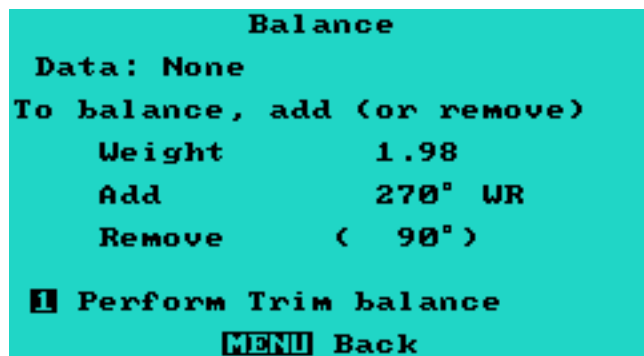
With Initial and Trial readings completed, the Balancing Menu will display the Balance option.



### 3. Balance

The Balance Menu presents a solution based on the results of the initial and trial readings. The balance solution provided is shown as the recommended weight to be added or removed at the given position(s) based on the balance solution type chosen.

- From the Balancing Menu, press **LIGHT 3** to proceed with balancing.

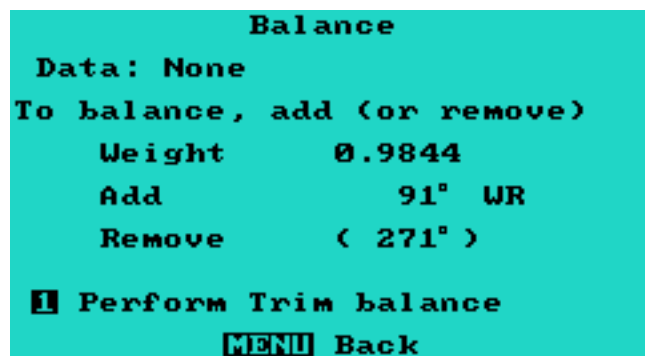


At this point, you can select an alternative balance solution type by pressing **MENU** then **RESET 1** to return to the Set Balancing Parameters Menu. The instrument will translate the balance results using the new solution type.

- Stop the machine rotation and position or remove balance weight(s) on the machine as indicated by the instrument.
- Restart the machine before pressing **RESET 1** Perform Trim Balance.

## Perform Trim Balance

Perform Trim Balance confirms the balance level achieved after the weights were positioned. After another measurement is taken, the Balance Menu will display the new balancing requirements.




```
Balance
Data: None
To balance, add (or remove)
Weight      0.9844
Add         91° WR
Remove     ( 271° )
Perform Trim balance
MENU Back
```

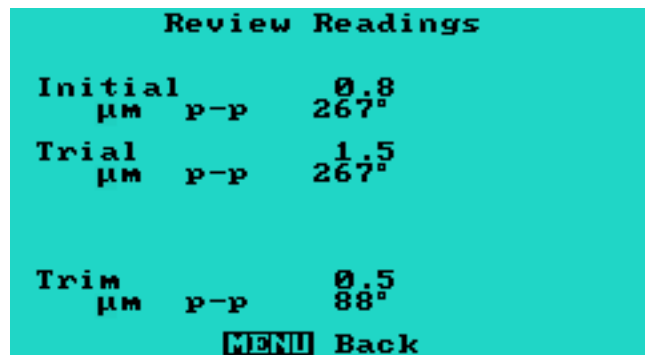
The balance process can end at this point or continue with another reposition of balance weights, as indicated, to improve on the balance level. Repeat until you are satisfied with the results or no further reduction of imbalance can be achieved.

The Calculate ISO 1940 balance function is provided with the instrument to help you determine the acceptable level of residual imbalance for your rotor. See Section 5: ISO 1940 Limits, for details.

## 4. Review Readings


Review Readings reviews the results of the Initial Reading, Trial Reading, and latest Trim Balance Reading. These values can be saved to, or loaded from, data storage as described in Section 3: Load/Save Balance.

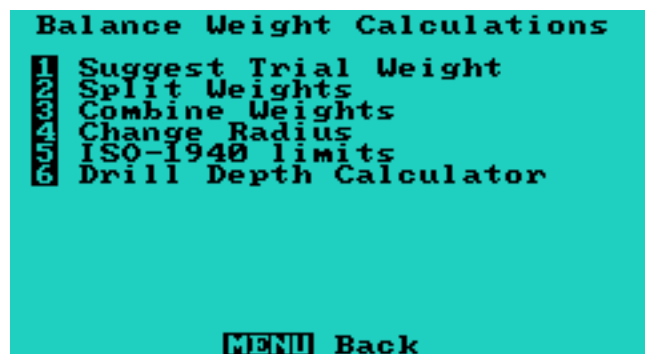
- The Review Readings screen is accessed by pressing  from the Balancing Menu.



## 5. Balance Weight Calculations

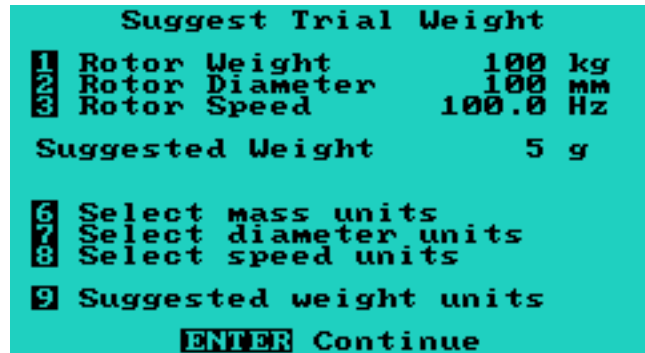
This menu provides a number of useful calculation tools which support you in performing balancing operations.

- The Balance Weight Calculations Menu is accessed by pressing  from the Balancing Menu.



## Suggest Trial Weight

This tool aids you in determining the appropriate amount of suggested balance weight to use based on the weight, diameter, and speed of the spinning portion (Rotor) of the equipment being balanced.



You also have the option of using different units of measure for the mass of the Rotor (lb, oz, kg), the Rotor diameter (in, mm), the Rotor speed (Hz, RPM), and the Balance Weight units (oz, g).

**Note:** Changing from one unit to another does not directly translate the associated value. You will need to reset the value, as needed, to match the application.

## Split Weights

This tool allows you to take a calculated single point balance solution (correction weight and angle), and translate it into a two weight (split weight) solution. You will need to define the two new correction angles so that the resulting balance weights at each angle can then be calculated.

## Combine Weights

This tool allows the user to take a calculated two weight (split weight) solution, and translate it into a single point balance solution. Here the user must define the weight and angle of the two beginning balance masses. It is possible to combine a three or more balance weight solution (like Fixed Position solutions) by using the calculator to reduce pairs of weights in succession, using resulting single points as input points for another combine weights calculation.

## Change Radius

This tool takes a single point balance solution and allows you to find a new balance weight based on a change in radius for the existing balance weight. The calculation assumes the angle of weight placement will remain constant and only the distance from center of rotation is changed.

## ISO 1940 Limits

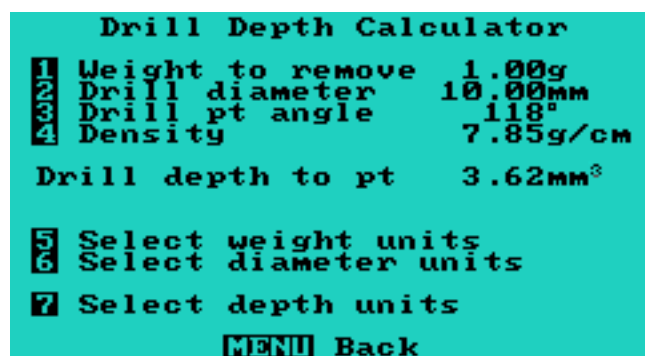
This calculation computes the maximum allowable residual imbalance to achieve a desired standard of balance. Please refer to the ISO 1940 standard to find which G levels are appropriate for a particular machine.

This calculator uses the rotor weight, the diameter at which correction weights are added, the speed and the required balance level to determine a maximum residual weight. Units can be toggled in a similar manner to the trial weight correction screen. If the reported correction weight to add or remove is less than this residual, the chosen ISO balance standard has been reached.

When balancing in two planes it is normally sufficient to simply allow half of this residual imbalance on each plane. For asymmetric or overhung rotors, please refer to the ISO 1940 balancing standard.

## Drill Depth Calculator

For some applications, it is better if the final, permanent balance weight is achieved by drilling out material rather than attaching weight to the rotor. NB This option should be used **after** all trim balances have been carried out. The Drill Depth Calculator aids you in determining the depth of the drill hole required.



The Drill depth to pt value (middle of the screen) is calculated automatically when you enter the following values:

- 1. Weight to remove**      The amount of weight that you will need to drill out of the rotor.
- 2. Drill diameter**      The size of the drill bit that will be used.
- 3. Drill pt angle**      The angle of the drill point being used. This will allow angles between 2° and 180° (180° = flat-ended drill).
- 4. Density**      The density of the material being drilled. This screen displays a list of common materials and their respective densities.
- 5. Select weight units**      Toggles the displayed weight units between ounces and grams.
- 6. Select diameter units**      Toggles the displayed diameter units between inches and millimeters.
- 7. Select depth units**      Toggles the displayed depth units between inches and millimeters.

When removing weight instead of adding, do so at a position 180° opposite from the 'add weight' position.

## 6. Load/Save Balance






Load/Save Balance gives you access to 200 individual memory storage locations (the same locations are accessible under both the Monitor Vibration and Balancing Menus). Current data can be saved to these locations, and later retrieved for comparison or use.

**Current data** – The data currently in the instrument's active memory. This data is either the result of recent measurements, or data that was loaded into active memory from one of the 200 storage locations.

**Saved data** – The data stored in any one of the 200 memory storage locations.








Each memory location can be named as needed to provide a useful label for your recordings.

- Select the desired memory location using the   arrow keys to scroll from one location to the next on the screen.
- Press  with the   arrow keys to scroll by units of 10.
- Press and hold the arrow keys to accelerate the scroll speed.

Once a memory location is selected (indicated by the black, highlighting bar), the possible operations include:

**1. LOAD** data stored in the memory location into the instrument's current memory. The stored data includes the parameter settings, the initial and trial readings, and trim readings.



**Caution:** This operation will overwrite any data already in current memory.

**2. EDIT** the name of the memory location. Use this function to create and edit names for each memory location in use. The name should clearly indicate the contents of the data to be stored. Users may choose to store measurements by machine, date, or other criteria as needed. To erase a name, select it from the list, press   to edit, then clear the name by pressing  +  .



The screen prompts indicate what options are available for data entry (see Section 2: Entering Text and Numbers).




**3. SAVE** data in current memory to the selected memory location.

**Caution:** This operation will overwrite any balance data already stored in this memory location. The  symbol is displayed to the right of any memory location that has data stored in it. The  symbol is displayed to the right of any memory location that has balancing data stored in it.



**4. DELETE** a memory location's contents. This will erase all data stored in a memory location, but will leave the name of the location unchanged.

## Erasing a Machine

To erase a machine, delete its data then clear or change its name.

- Select the machine from the list and press  to delete all data.
- To erase the name, press  to edit, then clear the name by pressing .


## Clearing Currently Displayed Data

The current machine name and measurement values shown on the screen can be erased by pressing  +  from the Balancing or Monitor Vibration Menus.

The first press will erase the displayed recordings values from the screen (the vibration units, phase angle and RPM).

Pressing  a second time will reset the name to 'None'.

The first press will erase any Trim Balance data from the screen


Pressing  a second time will erase all Trial Recording data including Initial Reading.

Pressing  a third time will reset the name to 'None'.

Any data that is cleared from either menu will remain in memory if you have used the Load/Save Balance option to create a named memory location.

## Balance Reports

The Balance Reports Menu allows current data and stored data to be transferred from the instrument to a PC for record keeping or additional analysis.

- To access the Balance Reports Menu, press  Balance Reports, from the Main Menu.



All reports will produce a comma delimited output showing the following columns of data:

### Data Label, Date, Time, Measurement type, Plane, Value, Units, Phase

Reports will not include the above column headers, but will look like the following for each report option:

#### Standard Report - Current Data

(Initial / final balance data reported - current memory only).

*Current Data, 11 OCT 02, 11:04:31am, Initial, Plane1, 16.0,  $\mu\text{m}$  p-p, 298*

*Current Data, 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3,  $\mu\text{m}$  p-p, 234*

#### Standard Report - All Data

(Initial / final balance data reported - current memory + storage locations).

*Current Data, 11 OCT 02, 11:04:31am, Initial, Plane1, 16.0,  $\mu\text{m}$  p-p, 298*

*Current Data, 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3,  $\mu\text{m}$  p-p, 234*

*GRINDER 9, 11 OCT 02, 11:04:31am, Initial, Plane1, 18.0,  $\mu\text{m}$  p-p, 278*

*GRINDER 9, 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3,  $\mu\text{m}$  p-p, 210*

...followed by all other saved memory locations.

### **Extended Report - Current Data**

(All balance data reported - current memory only).

*Current Data, 11 OCT 02, 11:33:04am, Initial, Plane1, 5.0,  $\mu\text{m p-p}$ , 227*

*Current Data, 11 OCT 02, 11:33:04am, Initial, Plane2, 4.3,  $\mu\text{m p-p}$ , 227*

*Current Data, 11 OCT 02, 11:33:04am, P1 Trial, Plane1, 12.8,  $\mu\text{m p-p}$ , 199*

*Current Data, 11 OCT 02, 11:33:04am, P1 Trial, Plane2, 10.5,  $\mu\text{m p-p}$ , 199*

*Current Data, 11 OCT 02, 11:33:04am, P2 Trial, Plane1, 11.0,  $\mu\text{m p-p}$ , 233*

*Current Data, 11 OCT 02, 11:33:04am, P2 Trial, Plane2, 9.5,  $\mu\text{m p-p}$ , 233*

*Current Data, 11 OCT 02, 11:33:04am, Residual, Plane1, 0.3,  $\mu\text{m p-p}$ , 212*

*Current Data, 11 OCT 02, 11:33:04am, Residual, Plane2, 0.3,  $\mu\text{m p-p}$ , 212*

**Note:** Shown for Dual Plane Balance, separate data taken for each plane.

### **Extended Report - All Data**

(All balance data reported - current memory + storage locations).

*Current Data, 11 OCT 02, 11:33:04am, Initial, Plane1, 5.0,  $\mu\text{m p-p}$ , 227*

*Current Data, 11 OCT 02, 11:33:04am, Trial, Plane1, 12.8,  $\mu\text{m p-p}$ , 199*

*Current Data, 11 OCT 02, 11:33:04am, Residual, Plane1, 0.3,  $\mu\text{m p-p}$ , 212*

*MACHINE#5, 11 OCT 02, 11:33:04am, Initial, Plane1, 8.4,  $\mu\text{m p-p}$ , 122*

*MACHINE#5, 11 OCT 02, 11:33:04am, Trial, Plane1, 15.3,  $\mu\text{m p-p}$ , 99*

*MACHINE#5, 11 OCT 02, 11:33:04am, Residual, Plane1, 0.4,  $\mu\text{m p-p}$ , 157*


...followed by all other saved memory locations.

**Note:** Shown for Single Plane Balance.

## **Transferring Data to a PC**

Report Grabber is a terminal communication program that handles data transfer from the instrument to the PC. See next topic for the website download location and installation instructions.

**Note:** Any other terminal communication program such as HyperTerminal (located under Accessories>Communications on Windows systems) may be used in place of the Report Grabber software.

- Connect the supplied serial cable to the RS232 port on the instrument and the serial COM port on the PC.
- On the PC, open the Report Grabber software.
- Follow the onscreen instructions to enable Report Grabber to receive data from the instrument.
- On the instrument's Select Machine Menu, select and load the machine you want to create a report on into memory. If you are producing a report for all machines please miss this step.
- From the Main Menu press  Balance Reports, then select the type of report to be sent to the Report Grabber.

Sent data appears in the Report Grabber and is automatically placed on the clipboard of the PC for pasting into spreadsheets and other documents.

Use the following COM port settings with any terminal communication program:

- Baud Rate: 57 600
- Data Bits: 8
- Parity: None
- Stop bits: 1
- Flow Control: Hardware

## Installing Report Grabber

Registered customers can obtain Report Grabber from the vbSeries download page on the Commtest website [www.commtest.com](http://www.commtest.com).

After downloading, install Report Grabber by double-clicking the downloaded file. This will create a desktop icon on the PC. Double-click the icon to run the Report Grabber program. Follow the onscreen commands to copy and paste data from Report Grabber into a text editor or spreadsheet program on your PC.

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# Section 5: Balancing Walkthrough - 0-360 Degrees Solution Type

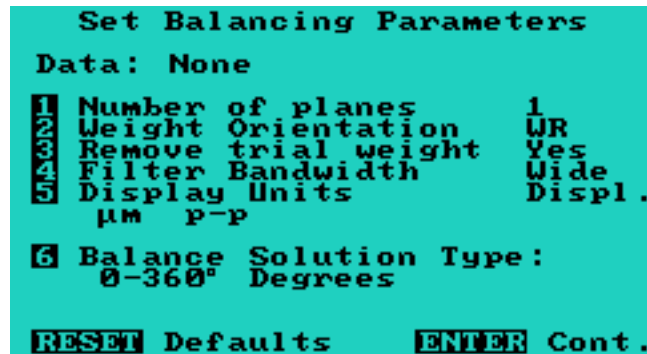
This walk-through guides you through the process of balancing a rotor using a single point solution.

You will learn to:

- Set balancing parameters
- Take initial imbalance measurements
- Setup and apply trial weights
- Perform balancing and trim balances

## Step 1. Set Balancing Parameters

The following screen shows the parameters that were set for this walkthrough.

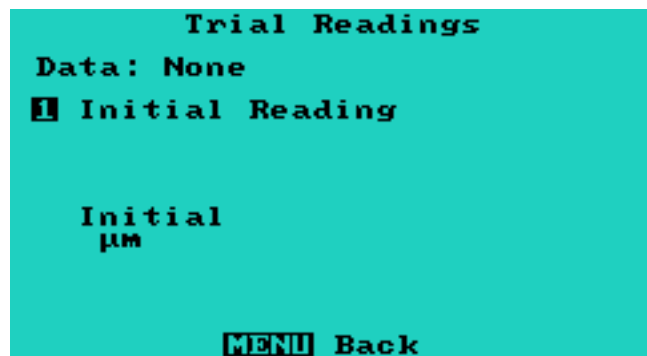



- From the Main Menu, select **HELP** **2** Balancing Menu, then press **RESET** **1** to select the Set Balancing Parameters Menu. See Section 4: Set Balancing Parameters, for details of how to set up your parameters.

Note that **Data:** has a value of 'None' because no machine has been loaded into current memory (i.e. chosen from the Select Machine Menu). You can name a machine or select an existing machine before taking measurements, or save the recording to a new or existing machine when you have finished balancing.

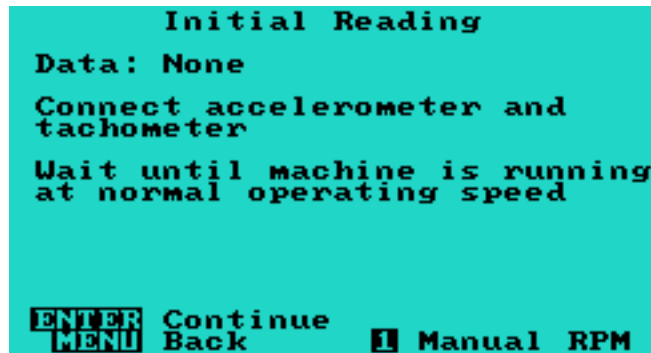
## Step 2. Initial Reading


- Press **HELP** **2** from the Balancing Menu to display the Trial Readings Menu.

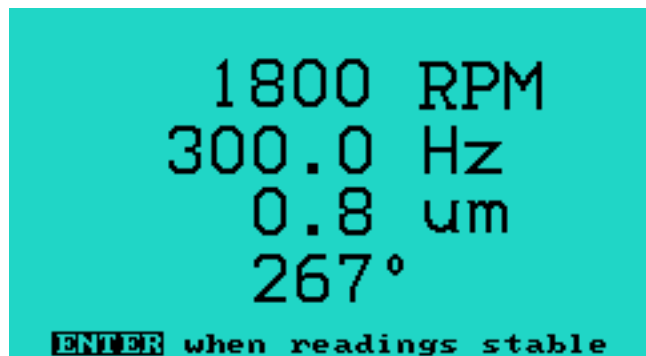



- Press  to perform an initial measurement of imbalance, which defines the starting point of the balancing procedure.

An instruction screen is displayed, indicating the need to connect the vibration sensor and tachometer, and bring the machine to normal operating speed before conducting the measurement.



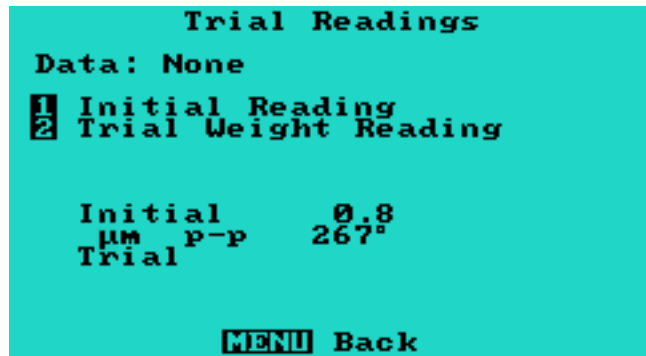
- Press  and wait for the Initial measurement to be displayed in RPM, Hz,  $\mu\text{m}$ , and degrees.




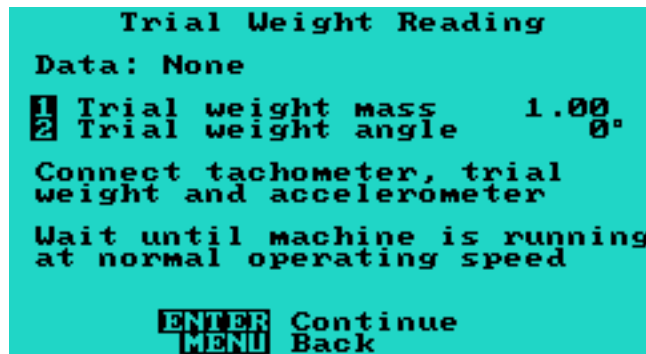
- When the readings are stable, press  to record values. Note that our recording shows an amplitude of 0.8  $\mu$ . The aim is to reduce this to an acceptable level.


## Step 3. Trial Weight Reading

The Trial Readings Menu will again be displayed and the Trial Weight Reading option is now available.



- Stop the machine rotation and press  to proceed with Trial Weight Reading setup.



- Enter your own trial weight mass by pressing  to display the Enter Trial Weight Menu then use the number keys to enter a value.

- Press  to continue.

```


Enter Trial Weight

      2.00

For larger values, scale the
implied units, eg. for 260g,
enter 0.26kg

  0-9  0.00 - 255.99
  MENU Cancel
  ENTER Continue

```

- Enter your own trial weight angle by pressing  from the Trial Weight Reading Menu. Use the number keys to enter a value.

```

Enter Trial Angle

      90 °

  0-9
  MENU Cancel
  ENTER Continue

```

- Press  to continue.

The Trial Weight Reading Menu now displays the new trial weight mass and angle.

```

Trial Weight Reading

Data: None

1 Trial weight mass      2.00
2 Trial weight angle    90°

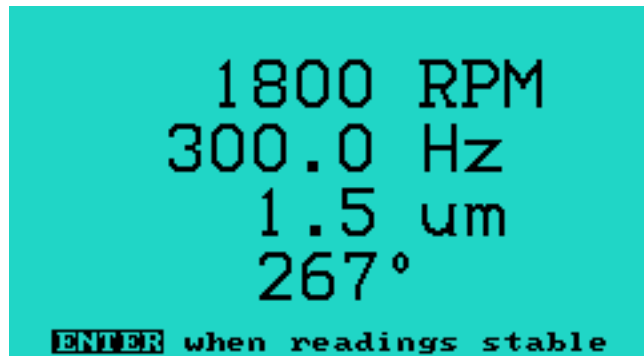
Connect tachometer, trial
weight and accelerometer

Wait until machine is running
at normal operating speed

  ENTER Continue
  MENU  Back

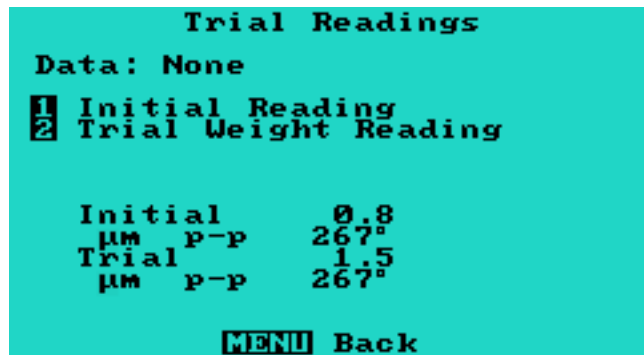
```

- Attach a trial balance weight at the indicated position (in this case 90°), and restart machine rotation.
- Press **ENTER** to take a new measurement. Note that our recording now has an amplitude of 1.5  $\mu$ . The initial trial weight has actually increased the imbalance.



1800 RPM  
300.0 Hz  
1.5  $\mu$ m  
267°  
**ENTER** when readings stable

After performing and recording the trial weight reading, the Trial Weight Menu is updated to display the values recorded, as shown.



**Trial Readings**  
Data: None  
1 Initial Reading  
2 Trial Weight Reading

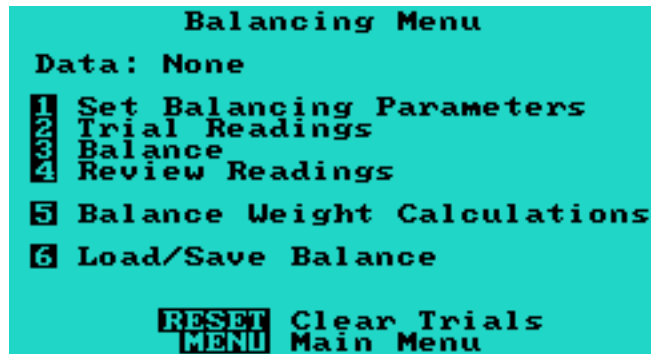
Initial		0.8
$\mu$ m	p-p	267°
Trial		1.5
$\mu$ m	p-p	267°

**MENU** Back

- Press **MENU** to exit the Trial Readings Menu and return to the Balancing Menu.

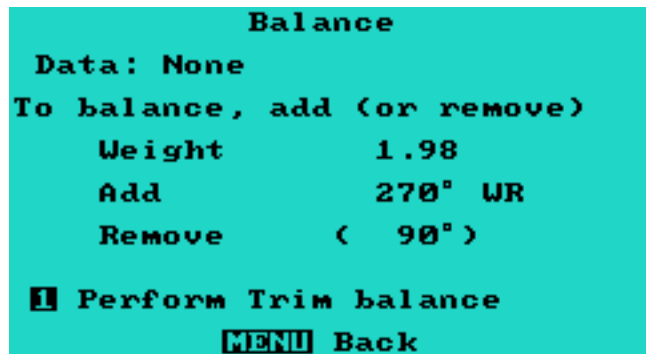
## Step 4: Balancing

With Initial and Trial readings completed, the Balancing Menu will display the Balance option.




- Press  to proceed with balancing.

The Balance Menu displays the balance solution requirements.

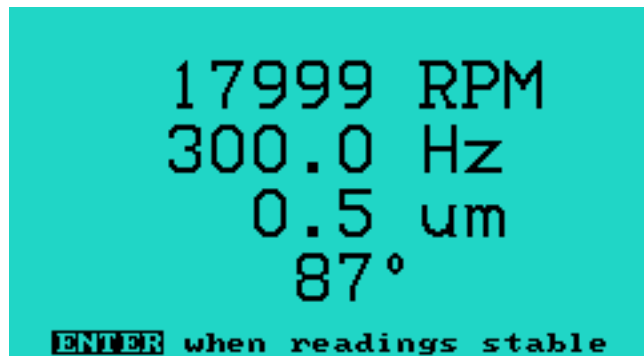


- Stop the machine rotation and position or remove balance weight(s) on the machine as indicated by the instrument and then proceed to Trim Balance.

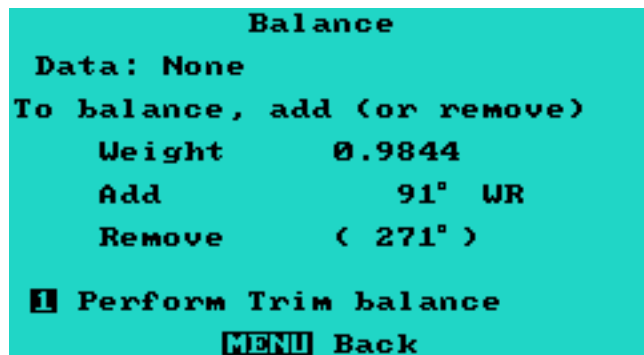
## Step 5: Trim Balance

- Restart the machine before pressing  to begin Trim Balance.


Trim Balance will take another measurement to confirm the balance level achieved when the weights were positioned. In our example the amplitude has now been reduced to 0.5  $\mu$ .



The Balance Menu will display the new balancing requirements.



You can end balancing at this point or continue with another reposition of trim balance weights, as indicated, to improve on the balance level. The Trim Balance process can be repeated until you are satisfied with the results, or no further reduction of imbalance can be achieved.

You can now review the recordings if you wish by choosing  Review Readings from the Balancing Menu.

---

## Section 6: Utilities

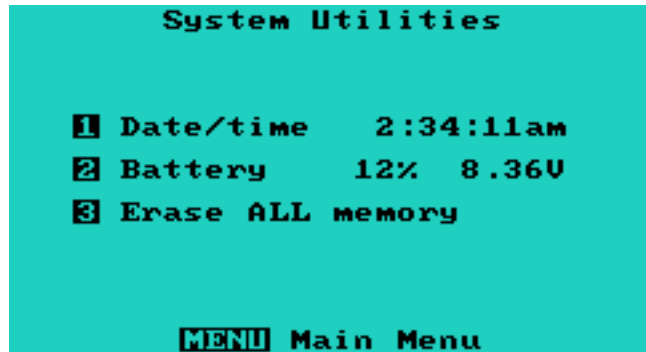
This section describes how to use the utility functions of your instrument.

You will learn to:

- Set the date and time
- Manage the vb battery pack
- Erase all recordings and machines
- Adjust the LCD display
- Upgrade the instrument firmware using PROFLASH





## System Utilities Menu

The System Utilities Menu is accessed from the Main Menu. This menu allows you to select options for setting the Date/time, manage the vb battery and erase all data.



## Set Date/Time

This menu allows you to change the current Date and Time used by the instrument.


- Press  to select an item to edit. The item will flash to show that it is selected.
- Use the   arrow keys to change the value of the currently selected item.
- Press  to save changes and exit.



## Battery Management

The instrument is powered by a rechargeable Nickel-Cadmium (Ni-Cad) battery pack. The normal operating range is 6.0 V to 8.5 V. The Battery Management Menu displays the current percentage of full battery charge available.

Some automatic features have been built into the instrument to help ensure that the battery pack is always sufficiently charged.

**Below 6.6 Volts**, the instrument displays a flashing  icon at the top left corner of the screen and beeps once every minute as a reminder that the battery pack needs to be charged. In the Battery Management Menu a flashing 'Low Battery' message is also displayed.

**Below 6.1 Volts**, the instrument automatically turns off the backlight to prevent further power draining.

**Below 80% battery capacity**, the instrument automatically begins to charge the battery pack if external power is supplied.

**At 5.5 Volts**, the instrument automatically powers down. The power saver is another feature that helps conserve power.

The instrument is equipped with an internal backup component that protects data and settings in case the battery pack is momentarily removed from the instrument. The backup component is kept charged by the battery pack if the battery pack is functioning normally.



**Warning:** Do not detach the battery pack from the instrument for more than 2 hours as this will drain the backup component, thereby causing data and setting to be lost.

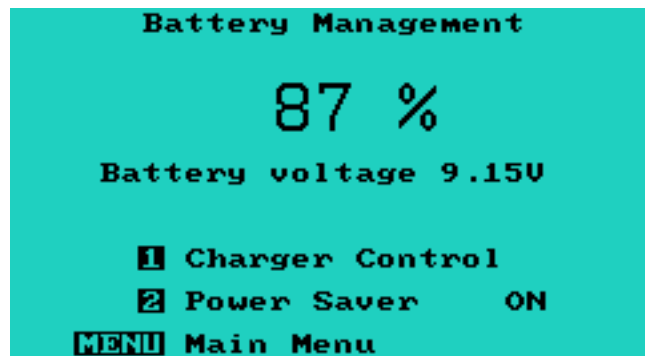
**Warning:** Before charging the battery pack, ensure that the power transformer used is an approved instrument power transformer 13.5 V  $\pm$  1.5 V DC, 1 A output, center positive, and that the voltage and frequency of your mains AC power matches that of the power transformer.

The battery pack can be charged by supplying  $13.5\text{ V} \pm 1.5\text{ V DC}$ , 1 A power to the instrument charger socket. The power transformer supplied in the kit provides this DC voltage. The optional car adapter charging lead may also be used to charge the battery pack in a vehicle with a 12 V negative-chassis power system.

## Checking the Battery Charge and Voltage

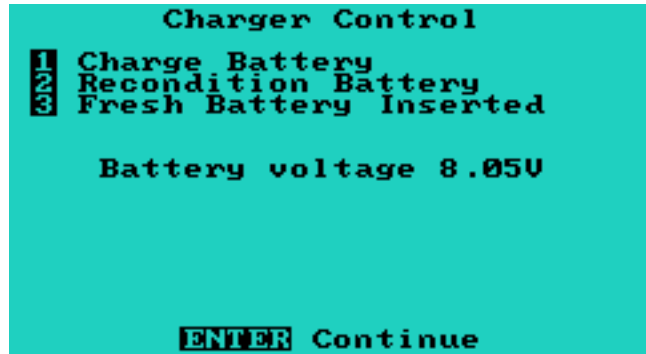
From the Main Menu

- Press  to access the System Utilities menu.
- Press  to display the battery charge level and voltage.



## Charger Control

This menu allows manual control of the battery charge function. The current battery voltage and charging state are displayed.



### Charge Battery

Manually begins battery charging cycle.



### Recondition Battery

Fully discharges and then automatically recharges the battery.



### Fresh Battery Inserted

Resets the battery capacity scale percentage to 100% at the current battery voltage.

These options are explained in detail in the following pages.




## Recharging the Instrument

**Warning:** Read the warnings in Battery Management (page 66) before charging the battery.


- Plug the power transformer into a standard power outlet and the connector to the instrument's charger socket.

If the battery charge level is less than 80% the battery will begin charging automatically. You can continue to use the instrument while the battery pack is being charged.

If the battery does not begin charging automatically follow the instructions below to begin charging.

- From the Main Menu press  Battery Management.
- Press  Charger Control.
- Press  to begin charging. A flashing 'CHARGING' message will be displayed.

If there is no power coming from the power transformer a flashing 'NO CHARGER' message will be displayed. If this happens, check that the mains power is turned on and the battery adapter is connected properly.




Charging stops automatically when complete or you can press  in the Charger Control Menu to stop the charging. A full charging cycle takes approximately 2 1/2 hours.

## Reconditioning the Battery Pack

**Warning:** Read the warnings in Battery Management (page 66) before performing this operation.

Battery reconditioning is the process of first discharging and then recharging batteries. It reduces the undesirable memory effect in the Ni-Cad battery. The battery pack should be reconditioned the first time it is used and at least once a month thereafter to prevent battery degradation. The recondition process will take up to two hours, depending on initial battery charge.

**Caution:** If the battery pack is not reconditioned the first time it is used, the battery charge displayed may be incorrect.

- Plug the instrument power transformer to a standard power outlet and its connector to the instrument charger socket.
- From the Main Menu press  Battery Management.
- Press  Charger Control.
- Press  to recondition the battery. Discharging is indicated by the flashing 'DISCHARGING' message on the screen.

The instrument automatically proceeds to charge the battery once the battery pack is fully discharged.

## Fresh Battery Inserted



This resets the battery capacity scale percentage to 100% at the current battery voltage. This option should be used when a new, fully recharged battery is exchanged for a discharged battery.

**Caution:** If this selection is made when the attached battery is not fully charged the battery capacity scale will no longer be set accurately. Performing a Recondition Battery will recharge the battery and reset the scale.

## Power Saver

Power saver is a feature that helps conserve power in the instrument. Power saver will turn the LCD display off after 8 minutes of inactivity (no key presses). The instrument will continue to function and any key press will turn the LCD on to the previously displayed screen. After 15 minutes of inactivity, power saver will power down the instrument. If the battery is being recharged, only the LCD screen will be turned off and the instrument will remain on until charging is complete.

The power saver is automatically turned on every time the instrument is powered up. You may turn it off temporarily by toggling power saver OFF from the Battery Management Menu.

- To turn off Power Saver, from the Main Menu press  Battery Management.
- Press  to toggle Power Saver ON and OFF.

## Replacing the Battery Pack



- Lift the boot stand.
- Unscrew the battery pack using a suitable screwdriver and screw in the new one.

**Warning:** Ensure that the battery pack is securely fastened but not over-tightened.





## Erase all Memory

Erasing memory is a two-step process. The first step will erase all spectrum data. The second step erases all machines and their associated balancing jobs.



### Erasing all spectra

- From the Main Menu, press  Utilities.
- Press  to select the Erase ALL memory option.



- Press  + . You will be prompted to confirm the deletion by pressing these keys again.
- Press  +  again to confirm deletion of all spectra



### Erasing all machines

- First clear any spectra (if you have not already done so) by following the previous instructions.
- Press  +  twice more to confirm deletion of all data.

To simply clear the current values from the screen, see Section 3: Clear Current Data.



## Adjusting the LCD Screen

### Adjusting the Contrast

- From the Main Menu press and hold  to darken the LCD.
- Press and hold  to lighten the LCD.

If the screen flickers when the cursors or highlight bar are moved rapidly, make the LCD darker.

### Restoring the Default Contrast

- From the Main Menu press  +  to restore the default contrast.

### Turning the Backlight On/Off

The backlight provides better LCD visibility in dark environments.

- In any screen, press  +  to turn the backlight on/off.

**Note:** The backlight consumes a relatively high level of power and will automatically turn off if the battery voltage falls below 6.1 V.

## Upgrading Firmware Using PROFLASH

To upgrade the instrument to the latest version of firmware you PROFLASH the instrument with the new firmware file. When an upgraded firmware version is available it will be posted on the Commtest Instruments Ltd website and can be downloaded free of charge from [www.commtest.com](http://www.commtest.com) under downloads>vbSeries.

- To view your instrument's firmware version, turn the instrument off then on again. The current firmware version is displayed at power up.



**Warning:** PROFLASHING will erase ALL recordings in the instrument memory.

- With the instrument turned on, connect and turn on the charger.
- Connect the instrument to a PC using the supplied communication cable.
- Download the latest firmware version from the Commtest website. The file will be called **VB\_xxxyy.exe** where xxx = the version number and yy = language translation.
- Double-click the downloaded file and follow the on-screen instructions.

**Note:** PROFLASHING the instrument takes approximately one minute. Do **not** interrupt the process as this will damage the instrument. The instrument's LCD screen will advise when the process is complete.

# Section 7: Troubleshooting

## Contacting Technical Support



If you have any problems please contact Commtest support staff directly for assistance. Our e-mail address is [help@commtest.com](mailto:help@commtest.com).

We also provide a searchable knowledge base of frequently asked questions (FAQ) on our website.

- The knowledge base can be found at [www.commtest.com](http://www.commtest.com). Click the FAQ link to access the knowledge base.

## Resetting the Instrument

**Warning:** If the instrument does not respond to any key press while it is operating it will continuously draw power until it is reset and turned off. You must reset a non-responding instrument as soon as possible.

- In any screen hold down  and press  then release to reset the instrument.

Resetting the instrument does not erase data or settings stored in the instrument.

## Data Problems

Symptom	Cause	Remedy
'Insufficient Memory' is displayed	No memory space left for new recordings	Erase obsolete recordings
Spectrum displayed seems incorrect	Accelerometer mounted to wrong location  Accelerometer not mounted properly  Accelerometer connected to wrong channel  Accelerometer damaged	Mount accelerometer on substantial structures near bearings and in the appropriate location and orientation  Ensure accelerometer is mounted firmly  Connect accelerometer to an enabled channel  Replace accelerometer

## Power Problems

Symptom	Cause	Remedy
Instrument cannot power up	Low battery level Electrostatic discharge (ESD exceeding 8 kV)	Charge battery pack Reset instrument
Instrument powers down when backlight is turned on	Low battery level	Charge battery pack
Instrument powers down shortly after powering up	Low battery level	Charge battery pack

## Other Problems

Symptom	Cause	Remedy
Instrument does not respond to any key press	Electrostatic discharge exceeds 8 kV	Reset the instrument
'DSP cmd' 'DSP no ack' 'DSP not rdy' 'DSp no cmd' or 'Stack overflow' displayed	Memory conflict	Turn the instrument off and on again. If the problem persists, send the instrument to an authorized dealer for servicing
'Switch off then connect module' is displayed	Module has worked itself loose (n.b. the module is where sensors are plugged in).  Module is damaged	Switch off the instrument and press firmly on the module or use an allen key to tighten it  Reset instrument  Test for module damage - switch off the instrument and plug in the battery charger. From the battery management menu press the 'menu' key. The main menu should appear without the model number (instrumentvb3000/2000/1000/vb1). This will confirm that the main instrument is OK and that the module is faulty. Send instrument to an authorized dealer for servicing.
Instrument does not seem to measure	Accelerometer drive current not turned on for ICP <sup>®</sup> type accelerometer  Sensor sensitivity set too low or high  Sensor not connected Sensor damaged Sensor cable damaged	Toggle ON the drive current in the Sensor Setup Menu  Match sensor sensitivity to sensor specifications (usually 100 mV/g) in the Sensor Setup Menu  Connect Sensor Replace Sensor Replace Sensor cable

# Appendix 1: List of Abbreviations

<b>AC</b>	Alternating Current
<b>A/D</b>	Analog-to-Digital
<b>CH</b>	Channel
<b>COM port</b>	Computer Serial Port (1 to 4)
<b>CPM</b>	Cycles per minute
<b>DC</b>	Direct Current
<b>DSP</b>	Digital Signal Processor
<b>ESD</b>	Electro-Static Discharge
<b>Hz</b>	Hertz
<b>In or "</b>	Inches
<b>ISO</b>	International Organization for Standardization
<b>KB</b>	Kilobytes
<b>kCPM</b>	Kilocycles per minute
<b>kV</b>	Kilovolts
<b>LCD</b>	Liquid Crystal Display
<b>LED</b>	Light Emitting Diode
<b>MB</b>	Megabyte
<b>MCPM</b>	Megacycles per minute
<b>MHz</b>	Megahertz
<b>µm</b>	Micrometer
<b>mm</b>	Millimeter
<b>ms</b>	Millisecond
<b>Ni-Cad</b>	Nickel-Cadmium
<b>PC</b>	Personal Computer
<b>rms</b>	Root-mean-squared
<b>RPM</b>	Revolutions per minute
<b>tach</b>	Tachometer
<b>V</b>	Volts
<b>vb</b>	The vb1000b vibration measurement instrument

# Appendix 2: Specifications

Specifications	Model vb1000b	Remarks
<b>Sensor Input</b> Number of channels Accelerometers Velocity sensors Displacement sensors Connector Input impedance Voltage swing Sensor excitation current Sensor excitation voltage Sensor detection	2 2-wire, low impedance piezoelectric, 100 mV/g nominal 100 mV/in/s (4 mV/mm/s) nominal 100 mV/mil (4 mV/μm) nominal BNC >100 kΩ 16 V peak-peak 0 mA or 2.2 mA (configurable) 24 V maximum Warns if short circuit or not connected	Commonly termed 'ICP® type'. Sensitivity (8.5 to 2300) mV/g Sensitivity (8.5 to 2300) mV/in/s = (0.34 to 90.55) mV/mm/s Sensitivity (8.5 to 2300) mV/mil = (0.34 to 90.55) mV/μm Safety feature: break-free inline connector  AC coupled input, allows for ± 8 V sensor output swing (± 80 g) 2.2 mA required for ICP® type accelerometer At sensor terminals with sensor attached Channel 1 only
<b>Tachometer Input</b> Sensor Laser sensor range Sensor supply Input type Pulse rating Speed range	Laser sensor with reflective tape included in kit 10 cm to 2 m nominal 7.2 V nominal 6.0 V to 9.5 V instrument battery Optically isolated, accepts TTL pulse 2.5 V (4 mA) min, 10 V (27 mA) max off-state < 0.8 V 30 RPM to 65 000 RPM (0.5 Hz to 1.08 kHz)	Sensor triggers when the tape reflects its beam Dependent on size of reflective tape Available to power sensor. Protected by 0.1 A PTC  Triggers on negative edge
<b>Parameter Indication</b> Measurement types Maximum levels Minimum levels Units Accuracy Frequency response	Acceleration, velocity, displacement ± 80 g (800 m/s <sup>2</sup> ), ± 4 in/sec (100 mm/s), ± 400 mil (10 mm) 0.01 g (0.1 m/s <sup>2</sup> ), 0.0004 in/s (0.01 mm/s), 0.01 mil (0.2 μm) g or m/s <sup>2</sup> , in/s or mm/s, mil or mm or μm ± 1% (0.1 dB) ± 0.1 dB from 10 Hz to 15 kHz; ± 0.5 dB from 3 Hz to 20 kHz	User selectable ∅-peak. Approximate, dependent on individual calibration  ∅-peak. Approximate, dependent on machine RPM  ∅-peak, peak-peak or rms Measured at 100 Hz, 23 ± 5 °C From value measured at 100 Hz
<b>Balancing</b> Planes Speed range Measurement type Weight modes Remove trial weights Filter bandwidths	1, 2 30 RPM to 60 000 RPM Acceleration, velocity, displacement Angle 0° to 360°, fixed position, circumference arc 2 equal weights, 3 equal weights Yes, No 15 CPM, 150 CPM	e.g. attach weights on fan blades, linear distance around circumference e.g. for balancing specialized grinders
<b>Logging Features</b> Output formats Data storage Data storage format	Text format via serial comms  200 balance jobs 200 named machines	Can be pasted into spreadsheet programs. Includes machine name, date and time, run plane, amplitude, unit and phase  User-specified machine names (16 characters) entered from vb keypad
<b>Spectrum Display</b> Fmax possible ranges Fmin possible range Spectrum parameters Spectrum averaging Frequency scale Amplitude scale Magnitude display Cursors Channel selection	0 to (100, 125, 150, 200, 300, 400, 500, 600, 800, 1000, 1200) Hz 0 to Fmax 800 lines, Hanning window 4 x linear, 50% overlap Hz, CPM Acceleration, velocity or displacement Overall rms value, cursor-position value Standard cursor Dual cursors Harmonic cursor Channel 1 or channel 2	Or equivalent CPM values  vb instrument zeroes all spectral lines below Fmin  Linear scale. Can zoom in to display individual spectral lines Linear or log scale Digital readout on chart Vary x position to display x and y values Lock standard cursor as reference and display difference Up to 32 whole-number multiples of standard-cursor frequency Single channel recordings

Revised 18 November 2005. As a result of Commtest's product development program, these specifications are subject to change without notice.