



# **Instrument Reference Guide**

**vbBalancer™ and vbBalancer+™  
Unbalance Correction Instruments**

**Revision May 5<sup>th</sup> 2011**

---

COPYRIGHT © 1999-2011 Commtest Instruments Ltd.

All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means electronic, mechanical, photocopy, recording or otherwise without the prior written permission of Commtest Instruments Ltd. For information, contact:

Commtest Instruments Ltd  
Level 2, 22 Moorhouse Avenue  
Christchurch  
New Zealand  
E-mail [help@commtest.com](mailto:help@commtest.com)

Printed in New Zealand.

### **Disclaimer**

The information contained in this document is subject to change without notice. Names and data used in examples are fictitious unless otherwise noted. This document is distributed as *is*, without warranty of any kind, either expressed or implied, respecting the information supplied, including but not limited to implied warranties for the document's quality, performance, merchantability, or fitness for any particular purpose. Neither Commtest Instruments Ltd nor its employees, dealers, agents or distributors shall be liable to the user of this document or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by this document.

### **Trademark Notice**

vb™, vb1000v™, vb1000™, vb2000™, vb3000™, vb5™, vb6™, vb7™, vb8™, vbBalancer™, vbBalancer+™, 6Pack™, Ranger™, vbXManager™, vbServer™ and PROFLASH™ are trademarks of Commtest Instruments Ltd.

vbSeries®, Commtest®, vbOnline® and Ascent® are registered trademarks of Commtest Instruments Ltd. Other trademarks and registered trademarks are the property of their respective owners.

# Contents

<b>Section 1: Introduction</b> .....	<b>1</b>
Standard Features .....	2
Standard Kit Items .....	3
Instrument Capabilities.....	4
Precautions.....	6
Hazardous Locations .....	8
Instrument Connections .....	10
Front Panel Buttons .....	11
LED Indicators .....	12
Charging the Battery Pack .....	13
Battery Features .....	13
Removing the Battery Pack.....	14
Operating Overview .....	15
Balancing.....	15
Onsite Analysis.....	16
<b>Section 2: Instrument Basics</b> .....	<b>17</b>
Powering On/Off .....	17
Navigating Menus .....	18
Returning to a Previous Menu.....	18
Using Navigation Keys and Icons.....	19
Selecting an Option from a List .....	20
Canceling an Option .....	22
Displaying Hint Labels and Detailed Help .....	22
Displaying Alternative Options .....	23
Entering Alphanumeric Characters .....	24
Entering Punctuation, Spaces and Special Characters .....	26
Using Other Icons .....	27
<b>Section 3: Using Sensors</b> .....	<b>29</b>
Supported Sensor Types .....	29

Connecting Sensors to the Instrument .....	30
Mounting Sensors .....	31
Setting up the Accelerometer .....	31
Permanent Mounting .....	33
Setting up the Tachometer .....	33
Tachometer Signal from a Keyphasor® .....	35
<b>Section 4: Balancing Rotors .....</b>	<b>37</b>
Methods for Balancing Rotors .....	37
The Balancing Process .....	38
Tips for Balancing .....	39
The Tachometer .....	39
Suggested Trial Weight Mass and Location .....	40
Manually Entering Balancing Information .....	40
Setting up a Balancing Job .....	41
Balance Planes and Weight Positions .....	42
Balance Planes .....	42
Weight Position (Reference Mark) .....	42
# Sensors .....	43
CH Position .....	44
Averages .....	46
Machine Information .....	46
Rotor Weight, Diameter and Speed .....	46
Reference Mark .....	46
Weight Orientation .....	47
Tach Trigger .....	47
Weight Lin Dist .....	47
Store Units .....	48
Combining and Splitting Trim Weights .....	48
Adjusting Weights for a New Radius Location .....	51
Reviewing Previous Balancing Jobs .....	52
<b>Section 5: Balancing Walk-through.....</b>	<b>53</b>
Step 1. Set Up a New Balance Job .....	53
Step 2. Take an Initial Reading .....	54
Step 3. Take a Trial Reading .....	55
Step 4. Balance the Rotor .....	58

Step 5. Perform Trim Balancing .....	59
Step 6. Viewing and Saving Balancing Jobs .....	61

## **Section 6: Analyzing Measurements Onsite.....62**

Tips for Taking Measurements.....	62
Walk-through: Taking Measurements.....	63
Working with Charts.....	66
Analyzing Measurements.....	66
Using Cursors.....	67
Zooming.....	69
Viewing Multiple Charts.....	70
Changing Chart View .....	71
Setting the Y Axis (Amplitude) Scale.....	72
Amplitude Display Units .....	73
Setting the RPM.....	74
Viewing Orders .....	74
Viewing Revolutions.....	75
Saving Measurements .....	75

## **Section 7: Setting Measurement Options .....77**

Setting Measurement Units and Spectrum Scaling .....	77
Setting Measurement Parameters.....	79
Creating Your Own Parameter Sets.....	80
Assigning Sensors to Channels .....	81
Explaining Spectrum Parameters.....	82
Fmax.....	82
Spectral Lines.....	83
Fmin.....	83
Tach Trigger .....	84
Averaging.....	84
Average Overlap.....	84
Explaining Waveform Parameters.....	84
Equivalent Fmax.....	84
Number of Samples.....	84
Duration .....	85

---

## **Section 8: Measurement Types and Their Uses.....86**

Spectrum .....	86
Waveform .....	87
Tachometer Display .....	87
Bump Test .....	88
Coast-down/Run up .....	89
Orbit Plot.....	90
Taking Multi-channel Simultaneous Measurements .....	92
Setting up Sensors and Channels .....	92
Saving Multi-channel Measurements .....	93

## **Section 9: Taking Recordings .....95**

Walk-through: Taking Recordings .....	95
Taking Individual and Multiple Recordings .....	96
Saving Recordings.....	97
Reviewing Recordings .....	97
Deleting Recordings.....	99
Attaching Notes .....	99

## **Section 10: Creating, Editing and Deleting Items ..100**

Storage Capacity and Recording Volume .....	100
How are Recordings Organized and Stored? .....	101
Working with Folders .....	102
Creating a Folder .....	102
Renaming a Folder.....	102
Deleting a Folder .....	102
Restoring a Deleted or Over-Written Folder.....	102
Working with Machines .....	103
Creating Machine Structures.....	103
Creating Parameter Sets .....	104
Adding Structures to Existing Machines.....	105
Copying Machine Structures .....	106
Renaming Machine Structures .....	106
Deleting Machine Structures .....	107
Working with Sensors .....	107
Defining and Editing Sensors .....	107

Using the Bias Voltage Check .....	109
Deleting Sensors .....	110
Working with Notes .....	110
Creating Notes .....	110
Editing Notes .....	111
Attaching Notes .....	111
Viewing Notes .....	112
Removing Notes .....	112
Deleting a Note Permanently .....	112
Deleting all Recordings in a Folder .....	113
Deleting all Stored Information .....	113
<b>Section 11: Utilities .....</b>	<b>114</b>
Setting the Date and Time .....	114
Adjusting the Date Format .....	115
Selecting Your Local Time Zone .....	115
Adjusting Sound Volume .....	115
Set the Instrument Language .....	115
Adjusting Screen Contrast .....	116
Turning the Backlight On/Off .....	116
Recharging the Instrument .....	117
Estimating Remaining Operating Time .....	117
Conserving Battery Power .....	118
Setting Backlight Timeout .....	118
Setting Sleep Mode Timeout .....	118
Setting Complete Powerdown Timeout .....	119
Managing Instrument Memory .....	119
Checking How Much Memory is Available .....	119
Instrument Memory Warnings .....	120
Freeing Instrument Memory .....	122
Reformat Memory Card .....	122
Empty Recycle Bin .....	123
Overwrite Primary Database with Mirror Backup .....	123
Display System Information .....	124
Using the vbXManager Software .....	125
vbXManager Software System Requirements .....	126
Installing vbXManager Software .....	126
Uninstalling vbXManager Software .....	127

---

Changing the Interface Language .....	127
Change the Software Interface Language .....	128
Change your Windows Locale Setting .....	128
Retrieve Balance Reports via vbXManager Software .....	130
Specify Balance Report Units.....	132
Adding a Company Logo to Your Balance Report .....	135
Viewing Existing Balance Reports in vbXManager .....	136
Upgrading Instrument Firmware (Proflashing) .....	136
Backing Up the Instrument Database.....	137
Export/Import Data via an External USB Flash Drive .....	138
<b>Section 12: Troubleshooting .....</b>	<b>141</b>
Contacting Technical Support .....	141
Resetting an Unresponsive Instrument .....	141
Changing USB Communications Mode .....	141
Troubleshooting Network Communications .....	142
<b>Appendix: Specifications .....</b>	<b>145</b>
vbBalancer .....	145
vbBalancer+ .....	147
<b>Index .....</b>	<b>149</b>

# Section 1: Introduction

Please read this guide thoroughly before operating your new vbBalancer instrument and retain for future reference.

Although this book makes use of common balancing and vibration analysis 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.**

## **Product and support feedback**

If you have questions that are not answered by this reference guide, please contact [help@commtest.com](mailto:help@commtest.com) for assistance. Alternatively, visit our website at <http://www.commtest.com> for additional resources and telephone contact details.

---

## Standard Features

- Balancing capability: single and dual plane
- Tachometer and Keyphasor® (only on vbBalancer+ instrument model) input for speed and phase measurements
- DSP for fast, accurate calculations
- 24-bit A/D converter providing high-precision measurements
- Displacement, velocity and acceleration measurements
- Frequency and time domain measurements
- 1 GB non-volatile flash memory providing almost unlimited recording storage
- USB host port for transferring data to and from an external USB flash drive
- Time and date stamped recordings
- vb firmware - upgradable using Commtest PROFLASH
- Temperature compensated graphical LCD (Liquid Crystal Display) with 480 x 320 pixels and white LED backlight
- 4500 mAh custom Lithium Ion battery pack
- Battery charger
- USB and Ethernet interfaces for PC communications

## Standard Kit Items

- vbBalancer portable imbalance correction instrument (vbBalancer or vbBalancer+) with carry strap and sensor bracket
- Power adapter 12 V 3 A output, center positive
- DC car adapter 12 V DC output
- USB data transfer cable
- Accelerometers (IEPE/ICP<sup>®</sup>-type)\*
- Accelerometer coiled cables\*
- Accelerometer magnetic mounting bases\*
- Triple BNC adapter (vbBalancer+ model only)
- vbXManager software on CD-ROM
- Instrument Reference Guide
- Warranty card
- QA card
- Carry bag

\* Number provided varies according to instrument model.  
vbBalancer: **2** units, vbBalancer+: **4** units.

### Balancing kit items

- Carry bag
- Non-contact laser tachometer sensor
- Reflective tape
- Adjustable tachometer stand with magnetic mount
- Tachometer extension cable (5 meters)
- Accelerometer extension cables (5 meters)<sup>+</sup>

<sup>+</sup> Number provided varies according to instrument model.  
vbBalancer: **2** units, vbBalancer+: **4** units.

**Note:** Thoroughly inspect your instrument kit's contents upon receipt. If any kit items are missing, please contact Commtest customer support or your sales agent for assistance.

## Instrument Capabilities

vbBalancer instrument capabilities vary according to model variant. For details of your specific instrument model's capabilities, see the information listed below.

### Measurement Channels (Max)

	vbBalancer	vbBalancer+
Dual (2) Channel Simultaneous	√	
Four (4) Channel Simultaneous		√

### Balancing Capability

	vbBalancer	vbBalancer+
Balancing 2 Planes	√	√
Balancing 2 Sensors	√	√
Balancing 4 Sensors		√

**Measurement Capabilities**

	<b>vbBalancer</b>	<b>vbBalancer+</b>
<b>Spectrum/Waveform</b>	√	√
<b>Bump Test</b>		√
<b>Coast-down/Run-up</b>		√
<b>Orbit Plot</b>		√

**Sensor Output Accepted**

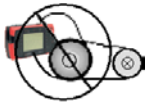
	<b>vbBalancer</b>	<b>vbBalancer+</b>
<b>Acceleration</b>	√	√
<b>Velocity</b>		√
<b>Displacement</b>		√

## 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 near the magnetic mounting bases (e.g. cardiac pacemakers, credit cards, floppy disks, video tapes, audio cassette tapes, mechanical watches).



Do not operate the instrument in an explosive environment.



Do not detach the battery pack from the instrument for more than 10 minutes. This will cause the instrument's date/time to be lost. The instrument will retain all recordings and other information.



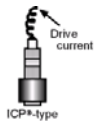
Neck-straps must be connected to the instrument via the 2.5 turn stainless steel rings provided. The strap must not be connected directly to the unit as this will defeat the 10 kg safety release provided by the rings. Replacement rings are available from Commtest.



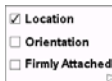
Use only an approved power adapter 12 V 3 A output, center positive. Do **not** use the plug-pack transformers supplied with previous Commtest instrument models (such as the vb1000-3000 and Profiler) as these transformers will be damaged.



The cover over the comms and charger connectors provides an essential seal. It must be in place whenever using the instrument in an industrial environment.



Ensure that the drive current is turned on when using an IEPE/ICP®-type accelerometer, otherwise the measurements will be incorrect.



Mount the sensor properly before taking measurements to ensure their accuracy and consistency.



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



Do not place the instrument or the magnetic mounting base anywhere that the temperature might exceed 140 °F (60 °C). This will degrade the battery pack and magnet.



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

## Hazardous Locations

Selected models of the vbBalancer range have been approved by the Canadian Standards Association (CSA) for use in hazardous locations meeting this classification: Class I, Division 2, Groups A, B, C and D.

Those models are clearly identified with the CSA logo and a Hazardous Location information panel. **Models without those markings are NOT approved for operation in hazardous locations.**

The Class I Division 2 classification is officially defined in the Canadian Electrical Code part 1, but can be summarized as:

A location in which volatile flammable gases or vapors are present but confined within closed systems from which they can escape only in case of accidental rupture or abnormal operation; or in which ignitable concentrations of gases are normally prevented by positive pressure or mechanical ventilation, and which might become hazardous through abnormal operation of the ventilation equipment.

The approval specifically covers use in the United States of America and also any other countries which recognize the CSA certification.

When using a certified vbBalancer in a hazardous location, the installation must comply with the vbX Installation Control Drawing for Hazardous Locations, including all its foot-notes and warnings. This drawing, number CIL2100VBX, is inserted on the following page.

The vbBalancer instrument will be supplied complete with appropriate sensors for use in Class I Division 2 environments. As indicated on the drawing, alternative sensors may be used, provided they are certified for use in these locations and their entity parameters meet the limits shown on the drawing.

## vbX INSTALLATION CONTROL DRAWING FOR HAZARDOUS LOCATIONS

### Drawing Number: CIL2100VBX

Entire drawing is for Hazardous Location (Class I, Division 2, Groups A, B, C, D)

Any loop-powered sensor (IEPE/ICP®) with certified input entity parameters:  
 $V_{max}: \geq 26.4 \text{ V}$   
 $I_{max}: \geq 47 \text{ mA}$   
 $P_{max}: \geq 310 \text{ mW}$   
 $L_i: \leq 28 \text{ mH} - L_{Cable}$   
 $C_i: \leq 360 \text{ nF} - C_{Cable}$

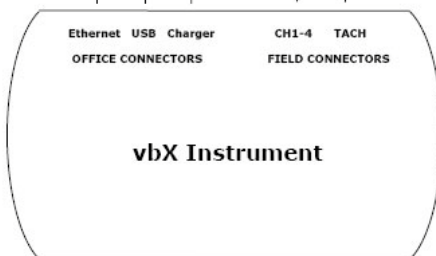
Any externally-powered sensor with certified output entity parameters:  
 $V_{oc}: \leq 30 \text{ V}$   
 $I_{sc}: \leq 25 \text{ mA}$   
 $L_o: \geq L_{Cable}$   
 $C_o: \geq 2 \text{ nF} + C_{Cable}$

Commtest AM1-100-T2 sensor with cable:  
 Length:  $\leq 10 \text{ m}$   
 Capacitance:  $\leq 200 \text{ pF/m}$   
 Inductance:  $\leq 1 \mu\text{H/m}$

Any vbX-powered sensor with certified input entity parameters:  
 $V_{max}: \geq 5.2 \text{ V}$   
 $I_{max}: \geq 53.3 \text{ mA}$   
 $P_{max}: \geq 277 \text{ mW}$   
 $L_i: \leq 22.8 \text{ mH} - L_{Cable}$   
 $C_i: \leq 830 \mu\text{F} - C_{Cable}$

Any externally-powered sensor with certified output entity parameters:  
 $V_{oc}: \leq 30 \text{ V}$   
 $I_{sc}: \leq 100 \text{ mA}$   
 $L_o: \geq L_{Cable}$   
 $C_o: \geq 2 \text{ nF} + C_{Cable}$

Not to be used in  
hazardous locations



#### Warnings:

1. Recharge or change battery only in a non-hazardous area.
2. Use USB or Ethernet only in a non-hazardous area.
3. Substitution of components may impair suitability for Class I, Division 2.

#### Notes:

1. No revisions of this drawing are permitted without CSA approval.
2. If the sensor model is not specified, any sensor certified for the location may be used provided that the sensor entity parameters meet the above conditions and the final installation meets also the individual installation requirements for each specified sensor.

**commtest**

instruments ltd

PO Box 9297, Christchurch, New Zealand.  
Tel: (64-3) 374 2337 Fax: (64-3) 374 2339

#### Title:

vbX INSTALLATION CONTROL DRAWING  
FOR HAZARDOUS LOCATIONS

#### Drawing No:

CIL2100VBX

#### Date:

3 September 2008

#### Revision:

2

## Instrument Connections

The top panel of the instrument is equipped with the following connectors:



1. Ethernet port. Connects to a standard 8P8C ('RJ45') male plug terminator

2. USB host port. Connects to an external USB memory device for data import and export (see Export/Import Data via an External USB Flash Drive (page 138))

**Note:** vbBalancer instruments with serial numbers below 40800 are not equipped with USB host ports.

3. USB socket. Provides a data connection between the instrument and a host computer equipped with vbXManager software

4. Charger power socket (12 Volt 3 Amp input). This may be used to power the instrument and/or to charge the instrument's battery pack

5. BNC sensor input (Channel 1)

6. BNC sensor input (Channel 2) OR LEMO seven-pin input\* (Channels 2 to 4)

7. LEMO four-pin tachometer input

\* This feature is only available on vbBalancer+ instrument model

**Note:** The comms and charger area's protective rubber gasket must be kept closed and in place when collecting data in the field. **Failure to do so may void your warranty.** IP65 rating (for instruments with serial number 40500 and higher) applies only while the gasket is securely in place.

## Front Panel Buttons



*Instrument Front Panel*



Turn the instrument On/Off.



Cancel/Go Back. A long press takes you back to the Main Menu.



Accept/Go Forward to the next menu.



Activate alternate functions for each key. In some menus the keys can perform several functions; to see what options are available press ALT to toggle the key functions.



Help key: expand on-screen icons with easy to see hint labels. A long press displays detailed help text.



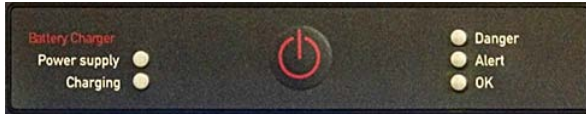
Navigate up/down through a list. To move more rapidly through a list, press and hold.



Navigate left/right. Also expands and collapses levels in the navigator and directs movement between split-screen menus e.g. the Review Vibration Menu.

## LED Indicators

Five LED indicators located on the instrument's front panel indicate the instrument's current state and warn of measurement problems.



*Instrument LEDs*

<b>Power supply (GREEN)</b>	Illuminates when power is supplied to the instrument from the power adapter.
<b>Charging (RED)</b>	Indicates that the instrument battery is charging.
<b>Danger (RED)</b>	Illuminates when a DSP or critical error occurs, or when the sensor bias voltage (page 109) is outside the specified range.
<b>Alert (AMBER)</b>	Not used on vbBalancer instrument models.
<b>OK (GREEN)</b>	Indicates that a measurement is being, or has been, collected successfully (without an error or alert triggered).

## Charging the Battery Pack

**Warning:** Before charging the battery pack, ensure that the power transformer used is an approved power adapter 12 V 3 A output, center positive. Do **not** use the plug-pack transformers supplied with previous Commtest portable analyzers such as the vb1000-3000 or Profiler instruments.

The power adapter supplied in the kit provides the correct DC voltage.

- Connect the AC power adapter included with the instrument to a powered outlet (100-240 Volt, 50/60 Hz).

**Note:** 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.

- Connect the adapter's DC output to the instrument's charger power socket. The instrument's **Power supply** and **Charging** LED indicators will illuminate indicating a charging state.

### Notes:

A full battery charge will complete in approximately **3 hours**.

The fast-charge Lithium Ion-type battery pack should be charged for a minimum of **1 hour** before or during its initial use.

## Battery Features

The instrument is powered by a rechargeable custom Lithium Ion battery pack with a normal operating range of 6.5 V to 8.4 V.

The instrument is equipped with an internal backup energy source to protect data and settings in the event that the battery pack is removed momentarily from the instrument. The backup is kept charged by the battery pack if the battery is functioning normally. The instrument includes a number of features that help ensure the battery pack is always sufficiently charged.

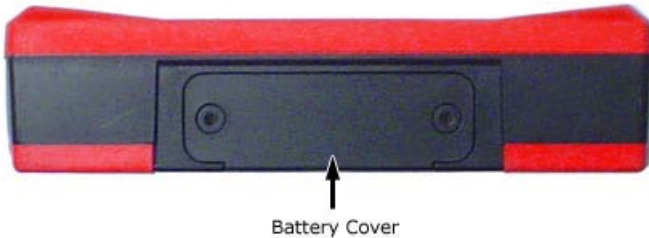
**Below 7 Volts** the instrument automatically turns off the backlight to prevent further power draining and displays a flashing battery icon as a reminder to recharge the battery.

**At 6.5 Volts** the instrument automatically powers down to conserve power.

With a battery charge of **25% or less** the instrument will enter Complete Powerdown Mode when powered off.

## Removing the Battery Pack

- Loosen the screws (2 x Phillips Head) attaching the battery cover to the bottom panel of the instrument.
- Set aside the battery cover and extract the battery.



**Warning:** Do not detach the battery pack from the instrument for more than 10 minutes. Doing so will cause the date/time to be reset, however all stored data will be retained.

Replacement batteries (part number BATT0206) are available from authorized Commtest Instruments distributors.

### Warnings:

Power should not be supplied to the instrument when removing the battery. Unplug any connected power adapters before proceeding.

Damaged batteries should not be re-inserted into the instrument. Dispose of damaged batteries responsibly and in accordance with local regulations. Do not disassemble the battery or dispose of in fire.

## Operating Overview

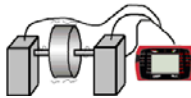
You can use the instrument to perform the following tasks:

- Balance machines using single and dual plane methods
- Take live, free run measurements for onsite analysis of vibration spectra and waveforms

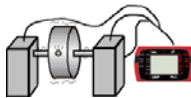
## Balancing

Analyze and correct rotating mass imbalance problems in-situ. A rigid rotor can be balanced in one or two planes.

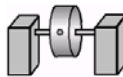
- Take an initial measurement of the imbalance.



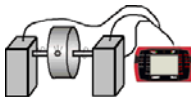
- Attach a trial weight to the balancing plane and take another measurement. For dual plane balancing, do the same for the second plane.



- Attach correction weights to the balancing planes as recommended by the instrument.



- Take a measurement in each plane to confirm that the rotor is balanced. Any residual imbalance can be removed via trim balancing.



## Onsite Analysis

Using your vbBalancer instrument you may measure vibration spectra and waveforms, and analyze them onsite immediately. This feature is suitable for one-off investigations.

- Set measurement parameters on the instrument.

Domain = frequency

Spectral lines = 800

Fmax = 1000Hz

... etc.

- Measure and analyze the spectrum or waveform.



- Record the data to memory (optional).




## Section 2: Instrument Basics

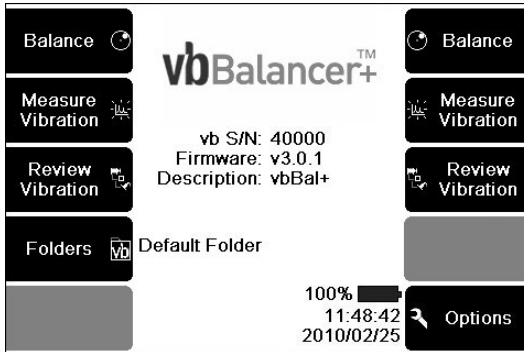
This section describes how to perform basic functions on your instrument.

You will learn to:

- Power up the instrument and turn it off
- Navigate menus and select options
- Enter and edit characters and punctuation
- Replace the on-screen icons with hint labels
- Display detailed help


### Powering On/Off


- Press  to power up the instrument or turn it off. The following menu displays at power up.




*Main Menu*

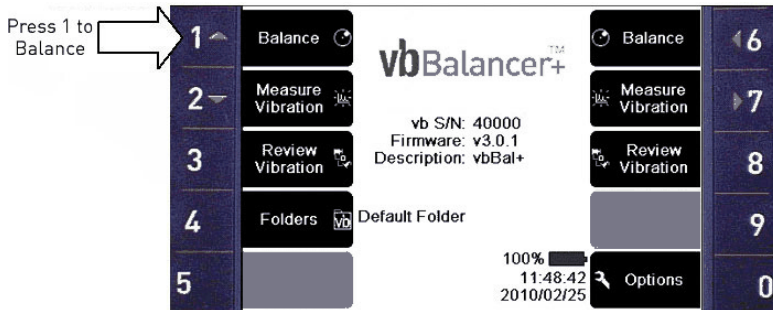
The Main Menu displays details such as the amount of charge remaining in the battery, today's date and time, the instrument serial number, firmware version, the instrument's user-defined description and the name of the currently selected folder.

- A long key press on  will always return you to the Main Menu.


**Note:** Once powered up, and with a battery state above 25%, pressing the  button will place the instrument into Sleep Mode not Complete Powerdown Mode. If the battery state falls below 25% charge, the instrument will enter Complete Powerdown Mode immediately when turned off.

## Navigating Menus


- To navigate menus, press the key that displays the name of the task you want to perform e.g. to begin balancing, from the Main Menu press  **Balance**.



## Returning to a Previous Menu

- To return to a previous menu press . If you have opened several sub-menus, pressing this key will return you to the original menu. A long press will return you to the Main Menu.

## Using Navigation Keys and Icons

Use the keypad arrows and on-screen arrow icons to navigate backwards/forward through menus, move up/down and across lists, and expand/collapse structures containing other items. When you are working with large numbers of machines, press  to collapse the displayed machine structures. This will speed up navigation as you can move the selection bar from machine to machine, rather than having to scroll through each individual parameter set, location and point.



Move the selection bar in the direction indicated.



Move the selection bar to the top of a single column list.  
Move one column to the left in a multi-column list.



Move the selection bar to the bottom of a single column list.  
Move one column to the right in a multi-column list.




Expand the highlighted machine structure to show its points, locations and parameter sets.  
Move to the right-hand side of the screen in a split-screen menu.







Collapse the highlighted machine structure so that only the top level is visible.  
Move to the left-hand side of the screen in a split-screen menu.

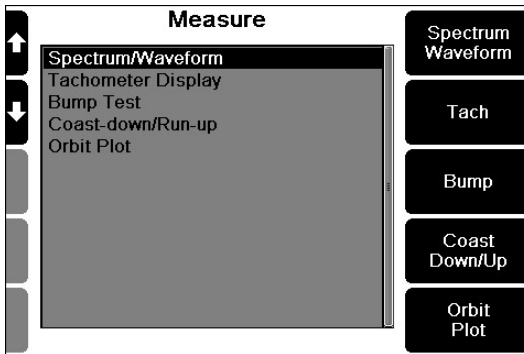
## Selecting an Option from a List

When there are a large number of choices available they will display in list format. On-screen arrows allow you to scroll up, down, or across a multi-column list by pressing the arrow keys.

- To select an option from a list use the arrows keys to move the selection bar until your option is highlighted, then press  to select that option.

### Example:




- From the Main Menu press  **Measure Vibration**.
- To select Tachometer Display press  or  repeatedly to highlight this option.
- Press  to select this option.



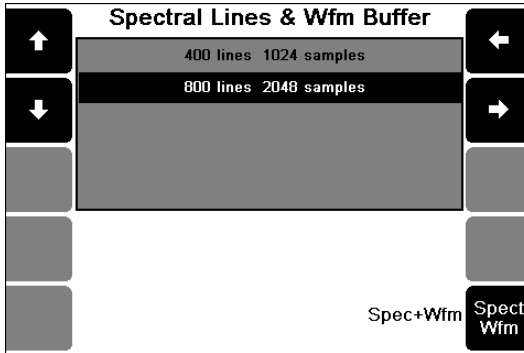
### Jumping directly to the end of a list

When there are a large number of options, left and right arrows will display on either side of the screen.

### Example:

- From the Main Menu press  **Measure Vibration**. (A long key press on  will return you to the Main Menu if you have another menu open.)
- Select **Spectrum Waveform** by pressing .

- Press **7** **Spectrum Waveform**. Left and right facing arrows will appear on the right-hand side of the screen indicating that you can 'jump' to either end of this list.
- To jump to the last entry in the list press **7**. Press **6** to jump to the first list entry.

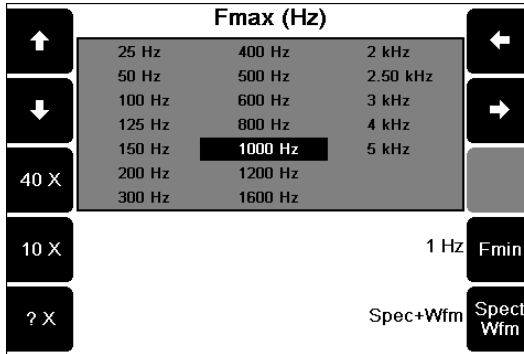


### Scrolling through a multi-column list

Lengthy lists are displayed in multi-column format. You can jump across the columns as well as scrolling up/down.

#### Example:

- Press **X** to return to the Spectrum/Waveform Menu, then press **8** **Fmax Fmin**.
- To move to the next column in a multi-column list press **6** or **7**.



## Canceling an Option

- To cancel an option press **X**. This will normally return you to the previous menu. If you have opened several sub-menus, pressing this key will return you to the original menu. A long press will return you to the Main Menu.

## Displaying Hint Labels and Detailed Help

Each on-screen icon can also display a hint label. Hint labels are turned off by default so that less screen space is used.

- To display hint labels press **?**. The hint labels will disappear when you press another key.

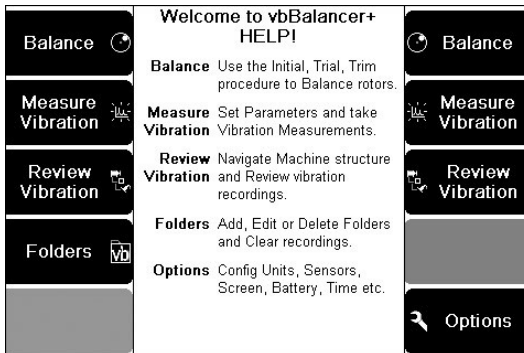


**Example:**

- From the Main Menu press **3** **Review Vibration**. (A long press on **X** will return you to the Main Menu if you have another menu open.)
- Press **?** to display the hint labels and press this key again to hide them. Press and hold **?** to display more detailed help information.

**Example:**

- From the Main Menu press and hold **?**. Detailed help text will be displayed.



- Press **?** again to hide the detailed help text.

## Displaying Alternative Options

Pressing a key causes the instrument to perform the task shown beside that key. For example, in the following picture, pressing **2** will cause the Y Axis of the on-screen chart to expand.

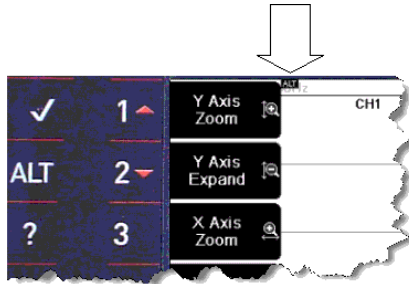


Chart menu before pressing **ALT**

However, in many menus one key can perform two functions. When this is the case a small **ALT** icon will appear at the top of the screen (see the arrow in the previous picture). Pressing the **ALT** key causes a different set of options to appear. The following picture shows the same chart menu after pressing this key.

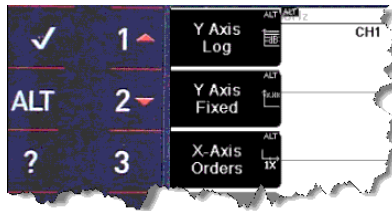


Chart menu after pressing **ALT**

## Entering Alphanumeric Characters

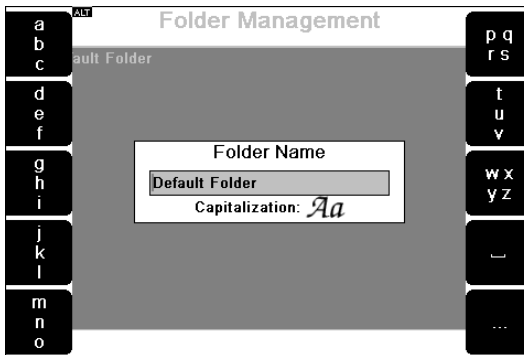
Names can be up to 50 characters long and contain a mix of upper case and lower case letters, spaces, numbers and punctuation. To enter letters and numbers use the instrument keys in the same manner as a 'multi-tap' type mobile phone, pressing the keys repeatedly to cycle through the characters until you reach the one you want to use. For example, to enter the number 7 press **7** four times. Pressing a different key causes the cursor to 'jump' immediately to the next space. If you need to use a character that is on the same key as the previously selected character, pause for a

moment until the cursor moves forward so that you don't overwrite your text.

### Example:

To rename the currently selected folder to FANS:

- From the Main Menu press **4** **Folders**.
- Press **3** **Edit Name**.



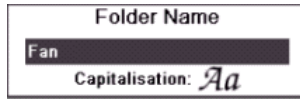
- Press **ALT** then **5** **Clear All** to clear the current folder name.
- Press **2** three times until 'F' displays.



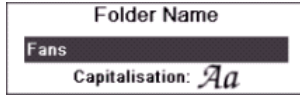
- To enter the letter 'a', press **1** once.



- Press **5** twice to display 'n'.



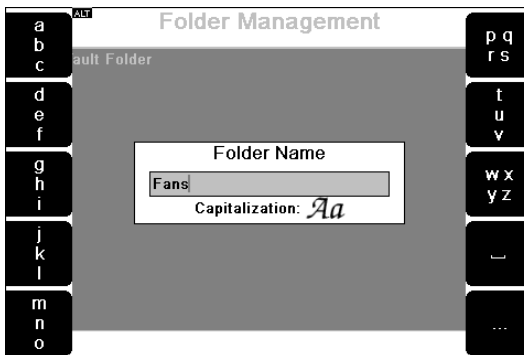
- Press **6** four times to display 's'.



- To enter a space between words press **9**. If you make a mistake and wish to delete a character press **X**.
- Press **ALT** then **?** to display the advanced editing menu containing options for using upper and lower case characters etc.
- When you have finished entering your text press **✓** to save.

## Entering Punctuation, Spaces and Special Characters

- To add punctuation, from the alphabetic character screen press **0** to display the punctuation menu.



- To use a punctuation character press the corresponding key. The instrument will then re-display alphabetic characters.

## Spaces and special characters

You can insert spaces between words, change from upper to lower case and delete or insert special characters as required. Pressing **?** to display hint labels will help you use the various editing commands.

### Example:

- From the Main Menu press **4** **Folders**.
- Press **3** **Edit Name**.
- Press **ALT** to activate alternative functions then **?** to display the advanced editing menu containing options for lower case letters, deleting characters etc.







## Using Other Icons






Each on-screen icon represents a function that you can use to perform a task, such as creating or deleting an item. To perform the task represented by the icon, press the key beside that icon.

Remember that you can press **?** to display hint labels for each icon.

Use these icons to create your machines.

Use	To do this
	Create a new machine
	Create a new point
	Create a new location
	Create a new parameter set

Use these icons to manage all your items.

Use	To do this
	Create a new item
	Edit the selected item
	Delete the selected item
	Copy the selected item into memory
	Paste the copied item to the highlighted position

## Section 3: Using Sensors

This section explains which sensors are compatible with your instrument and describes how to use them.

You will learn:

- What sensors may be used with your instrument
- How to use the supplied accelerometer and tachometer
- How to correctly mount a sensor

### Supported Sensor Types

The following table summarizes the sensitivities and types of measurement that can be taken by each sensor supported on each instrument model.

#### vbBalancer

Sensor Type	Sensitivity	Measurement Types
Accelerometer	mV/g 0.1-10 000	Acceleration Velocity Displacement

**vbBalancer+**

Sensor Type	Sensitivity	Measurement Types
<b>Accelerometer</b>	mV/g 0.1-10 000	Acceleration Velocity Displacement
<b>Velocity Sensor</b>	mV/in/s 0.1-10 000 mV/mm/s 0.34-90.55	Velocity Displacement
<b>Displacement Sensor (or prox probe)</b>	mV/mil 0.1-10 000 mV/ $\mu$ m 0.34-90.55	Displacement

For information on how to define a sensor see Defining and Editing Sensors (page 107).

## Connecting Sensors to the Instrument

Sensors are connected to the instrument via BNC and, in the case of the vbBalancer+ instrument, seven-pin LEMO socket. Use the provided triple BNC adapter (LEMO breakout cable) to connect channels 2 through 4 if using these channels on a vbBalancer+ instrument.



*BNC (left), seven-pin LEMO (right)*

**Note:** The triple BNC adapter's three BNC inputs are numbered to indicate channel.

**BNC** Attach the sensor cable plug to the BNC connector(s) by inserting and gently turning clockwise. Remove by turning in an anti-clockwise direction then pulling up

**LEMO** To attach a LEMO triple BNC adapter, line up the red dot on the LEMO connector with the red line on the instrument socket and insert. Remove by firmly gripping the connector and pulling away from the instrument without twisting.

**Warning:** Do not remove the LEMO connector by pulling the sensor cable. This may damage the cable. Always remove by gripping the end connector.

### Sensor Inputs

Input	vbBalancer	vbBalancer+
BNC 1 (Channel 1)	√	√
BNC 2 (Channel 2)	√	
LEMO 1 (Channels 2-4)		√
LEMO 2 (TACH)	√	√

## Mounting Sensors

Your choice of sensor mounting will affect the accuracy of balance jobs and vibration measurements.

Accelerometers are usually mounted using the supplied magnetic base. However, for permanent installations on balancing stands, they can be stud mounted as described in Permanent Mounting (page 33). You can also apply these instructions to velocity sensors.

You should mount tachometers according to the manufacturer's instructions.

## Setting up the Accelerometer

Plug the accelerometer connector into an instrument BNC sensor input (or into a triple BNC adapter connected to the instrument if using a vbBalancer+ instrument). Now screw the accelerometer into

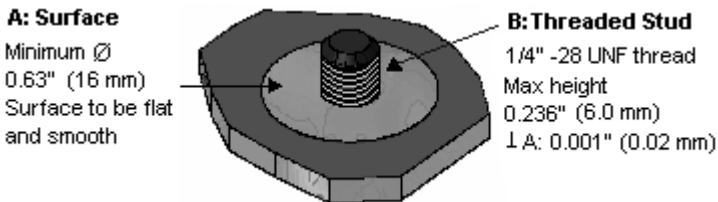
the magnetic base and attach it to the measurement point using these guidelines:

- Attach the accelerometer to a sturdy, rigidly mounted and non-flexible structure, where vibration from the rotating part of the machine will be accurately transmitted. Do not attach sensors 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.
- The attachment structure must be at least 10 times heavier than the accelerometer itself. Do not mount the accelerometer on lightweight motors or similar parts as the weight of the accelerometer will distort the vibration signal. Use a smaller accelerometer for small structures.
- Attach the accelerometer as closely as possible to, and in line with, the centerline of the bearings in order to avoid distorted signals.
- The mounting surface should be flat and smooth where the accelerometer makes contact. Attach the accelerometer using the supplied magnetic accelerometer base or a threaded stud on the machine surface. The accelerometer should not move independently of the machine part it is attached to.
- Ensure the accelerometer is oriented correctly as vibration can differ greatly with respect to direction.
- If you are undertaking an ongoing study of a particular measurement point, always attach the accelerometer at exactly the same position used for previous measurements (mark the position if necessary).
- Keep the accelerometer clear from other cables, ensuring it is not twisted, kinked or tangled.

## Permanent Mounting

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

- Unscrew the magnetic base from the sensor and screw onto the threaded stud. We recommend you use a thread locking compound.



*Stud Mounting Spot*

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

## Setting up the Tachometer

A tachometer collects information on a machine's rotation speed, providing you with an exact reading of machine speed as a measurement is taken. This is more accurate than using a default RPM as a machine's speed can vary significantly under different loads.

The tachometer also provides information on 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:** Instruments with serial numbers greater than 40800 (equipped with a second USB port for flash drives) use a low voltage 5 Volt tachometer output and must use the low voltage MiniVLS211/N Ex rated laser (Commtest product code LASA0315). Instruments with serial numbers lower than 40800 (those with only a single USB port)

output the full battery voltage of 6.5 - 8.4 Volts and should be used with the MiniVLS213 laser (Commtest product code LASA0062).

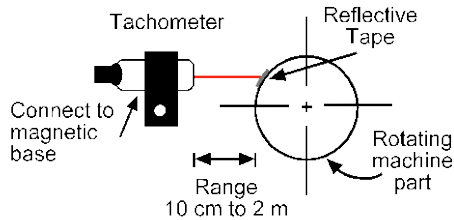
The low-voltage MiniVLS211/N laser tachometer *will* work with the older instruments, but will be over voltage. We therefore do not recommend this practice.

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

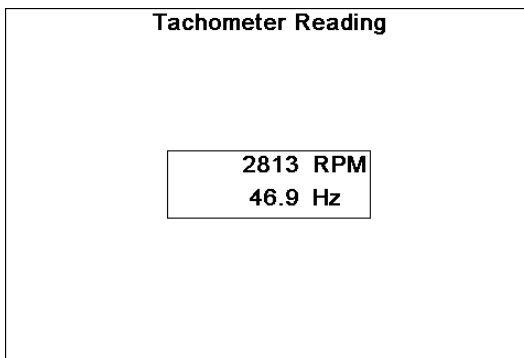
To comply with CSA Class I, Division 2 Hazardous Locations requirements, all instruments bearing the CSA logo **MUST** use the low voltage MiniVLS211/N laser tachometers.

### Setting up the tachometer

- Screw the tachometer block's grip extension into the end of the mounting base articulated arm.
- Plug the cable socket into the tachometer connecting pins then turn the locking ring to make a secure connection.
- Locate the TACH 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 tachometer 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.



- Start the rotor and wait till it is at normal running speed.
- Now test if the tachometer will trigger. From the Main Menu press **2** **Measure Vibration**.
- Press **7** **Tach**. The screen will display the rotor running speed in RPM and Hz. These values will continuously update but should stabilize, indicating that the tachometer is triggering reliably. If the RPM does not stabilize adjust the position of the tachometer.



## Tachometer Signal from a Keyphasor®

If your machine has a proximity-probe based tachometer sensor (e.g. Keyphasor®), this can be used as the tach signal for your vbBalancer+ instrument. The sensor should have a buffered front-panel BNC output, to ensure the instrument's measurements can't interfere with pre-existing speed measurements. Keyphasor LEMO

---

connector tach cables can be purchased through your local Comtest reseller for this purpose.

The Keyphasor proximity sensor gap should be adjusted so the driver box output is  $-8\text{ V} \pm 2\text{ V}$  (i.e.  $-6\text{ V}$  to  $-10\text{ V}$ ) when the sensor is over the shaft. This is the normal mid-range position for these sensors. When the sensor is over the keyway its output will be  $-14\text{ V}$  to  $-22\text{ V}$ , depending on its make and model.

## Section 4: Balancing Rotors

This section describes the procedure for performing balancing operations with your instrument.

You will learn to:

- Understand the balancing process
- Select appropriate balancing settings
- Set up a balancing job
- Manually enter balancing values
- Use the instrument's suggested balance weight calculations

### Methods for Balancing Rotors

The instrument can balance rotors that are rigid and which **do not** flex significantly at their operating speeds.

An unbalanced rotor is one that has an uneven mass distribution that causes the rotor to vibrate when it is rotated. Balancing a rotor requires 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 center of rotation. Making weight adjustments at the largest possible radial distance minimizes the amount of weight that needs to be added to or removed from the rotor.

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. Therefore, it is 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:

<b>Rotor Length to Diameter Ratio</b>	<b>Operating Speed</b>	<b>Balancing Technique</b>
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 you must 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 the units and balancing method.

**Initial Reading** - Measure the initial imbalance.

**Trial Reading** - Attach a trial weight to the balancing plane and take another measurement. For dual plane balancing, the same is also done for the second plane.

**Balancing** - Attach correction weights to the balancing plane(s) as recommended by the instrument.

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

## Tips for Balancing

- Before performing a balance job, clean the rotor removing any dirt or loose-hanging material such as rust, flaking paint etc, which may affect balancing results if they fall off later.
- Ensure that any weight(s) you add will not come loose at the normal rotor speed and that it will not obstruct machine motion. If possible, manually rotate the rotor to ensure that the weight does not clash with any part of the machine, keeping in mind that the rotor's center line may shift when operated at its normal speed.
- Ensure the weight of any mechanism used to hold the correction weights in place is included as part of the correction weight. If you are welding on the weight, make sure that the weight of the flux is not included (scrape the flux off before weighing the electrode).
- Ensure that the shape of the correction weight does not cause it to become a dirt trap since dirt accumulated on the weight may cause rotor imbalance.
- It is important to attach the correction weight(s) at the same radial distance that the trial weight was i.e. if the trial weight was attached 'n' mm/inches from the center of the rotor, the correction weight must also be attached 'n' mm/inches from the center of the rotor.

## The Tachometer

The tachometer provides the instrument with information regarding the rotational speed of a rotor 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 you must consider both the amplitude of vibration and also the phase angle. The amplitude shows the severity of the imbalance and the phase angle indicates the geometry of the imbalance (i.e. the location of the



heavy spot). Setting up the Tachometer (page 33) contains information on how to set up the tachometer to measure phase angles.

## Suggested Trial Weight Mass and Location

The instrument can assist with balancing operations by calculating an appropriate trial weight mass and location for you. Please refer to topics CH Position and Reference Mark, for help with calculating the trial weight location, and Machine Information, for help with calculating the trial weight mass.

## Manually Entering Balancing Information

You have the option to manually enter amplitude and phase values for the initial, trial and trim readings. This allows you to:

- Interrupt the balancing process without saving the values, then re-enter them later and continue balancing.
  - Experiment with different trial weight masses and placements to see the effect on the imbalance, without having to attach weights to the machine.
  - Calculate the effect of further trim balances.
  - Change the units used in a final balancing report by selecting different units then re-entering the collected values.
- To enter a value manually, work through the balancing setup process as normal then press  to take a reading. The icon  will appear in the upper left-hand corner of the screen (for a dual plane balance the CH2 icon will also appear).

- To enter your own values for CH1 press **1** (press **2** for CH2 when using two channels, or **1** and then select a channel when using three or more on a vbBalancer+).
- Press **1** to enter an amplitude value and **2** to enter phase. Press **✓** twice to exit and return to the Initial, Trial or Trim Reading Menu and continue the balancing job.

## Setting up a Balancing Job

The Balance Setup Menu gives you a large degree of flexibility in how you set up balancing jobs. Many of the setup items are optional; you can also select items in any order you wish e.g. you can select a machine to save the balancing report to at the beginning or end of the process, or perform balancing without saving the report.

- From the Main Menu press **1** **Balance**.
- Press **1** **New Job**. This clears any existing setup data from previous balancing jobs.
- Press **3** **Setup** and use the options in the Balance Setup Menu to apply your preferred balancing settings.

Balance Setup		
Balance Planes	1 (360°)	WR Weight Orientation
# Sensors	1	
# Averages	1	Standard Tach Type
Machine Information	(optional)	g/lb m Weight Lin Dist
Fmax	Automatic	mm rms Store Units

The rest of this section describes the Balance Setup Menu options. Balancing Walk-through on page 53 explains how to use these options when performing a balancing job.

## Balance Planes and Weight Positions

Use these options to set the type of balance job (single or dual plane) and specify a weight position reference system i.e. where on the rotor you will place the balance weights in relation to a reference mark.

### Balance Planes

- From the Balance Setup Menu press **1** then use the arrow keys to highlight the number of balance planes to use.
- Press **✓** to select. This will display the Balance Weight Setup Menu.

### Weight Position (Reference Mark)

Performing balancing operations on a rotor requires you to establish a positioning system for balance weights. To do this you must first establish a reference mark somewhere on the rotor circumference then choose the weight positioning system that is most appropriate for your balance job.

#### Degrees

Measure the angle in degrees ( $0^\circ$  to  $359^\circ$ ) from your reference mark. The radius of the rotor must stay constant.

#### Circumference arc

Measure the linear distance around the outside of the rotor from the reference mark to the balance weights.

#### # Fixed positions

Create a fixed number of attachment positions, e.g. drilled and tapped holes, that are equally spaced on a fixed radius from the center of rotation.

To assist with the physical balancing setup you can use a different weight position system for each balancing plane if desired.

- From the main menu screen press **1** **Balance**. Press **1** **New Job** to clear your setting or press **3** **Setup** to use your existing configuration

- Press **1** **Balance Planes** then use the arrow keys to highlight the number of balance planes to use.
- Press **✓** to select. This will display the Balance Weight Setup Menu.
- From the Balance Weight Setup Menu press **1** **Plane A Weight Position** then use the arrow keys to highlight your choice and press **✓** to select.
- If you select circumference arc or # fixed positions this will open the Circumference or # Fixed Position sub-menus where you need to specify the rotor circumference or the number of fixed positions. Enter the required value then press **✓**.

**Note:** The circumference units used (inches or mm) are set in the Balance Setup screen by pressing **9** **Weight Lin Dist** then **8** **Linear Distance**.

- If you have selected dual plane balancing press **2** **Plane B Weight Position** and repeat the previous steps for Plane B.
- Press **✓** repeatedly if necessary to return to the Balance Setup Menu from where you will specify your sensor settings. If you selected dual plane balancing, pressing **✓** will automatically take you to the Balance Sensor Setup Menu.

## # Sensors

This option lets you specify the number and type of sensors you are using. This menu also contains an option that allows the instrument to recommend where to place trial weights (optional).

- If the Balance Sensor Setup Menu is not already displayed press **2** **# Sensors** from the Balance Setup Menu then select the number of sensors required and press **✓**.

- Press **6** **CH1 Sensor** and select a sensor or **4** **Create New Sensor** if a new one as required (refer to Defining and Editing Sensors on page 107 for more information).
- Press **✓** to return to the Balance Sensor Setup Menu. To specify a 2nd, 3rd or 4th sensor for dual plane balancing press **7** to **9** as required and repeat the previous step.

**Note:** The vbBalancer+ instrument allows full four-sensor simultaneous monitoring of both horizontal and vertical axes on each bearing. This ability provides confidence that a balance on any one axis has not worsened vibrations on the other. The vbBalancer instrument allows simultaneous two channel dual plane monitoring.

- If you want the instrument to help you determine where to place your trial weights use the CH Position option on the left-hand side of the screen (see next topic), otherwise skip this step and press **✓** to return to the Balance Setup Menu.

## CH Position

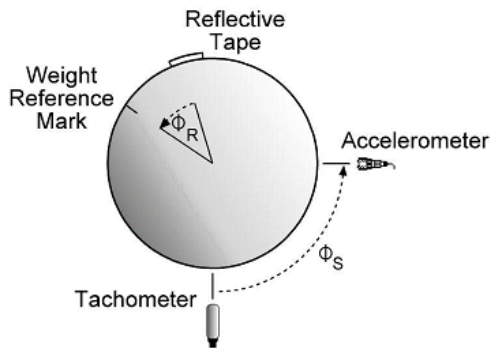
**Note:** This item is optional.

CH Position is used in conjunction with Reference Mark. The instrument uses this information to calculate where on the rotor you should place your trial weights after taking an initial reading. The aim is to reduce the initial vibration in order to maximize the accuracy of the trial weight readings. The instrument will recommend a trial weight angle based on the following:

- The phase of the initial reading
- The angle between the tachometer and sensor (the CH Position)
- The angle between the tachometer reflective tape and the weight reference mark on the rotor (the Reference Mark)

You need to enter **both** the CH Position and the Reference Mark Location so that the instrument can calculate the trial weight angle. See Reference Mark (page 46) for further instructions.

- If the Balance Sensor Setup Menu is not already displayed press **2** # **Sensors** from the Balance Setup Menu, select the number of sensors to use then press **✓**.
- Press **1** **CH1 Position** and enter the angle from the tachometer to your sensor ( $\Phi_s$ ) then press **✓**. For dual plane balancing, repeat this step if you want the instrument to recommend trial weight placement angles for both planes.



After you take the initial reading the instrument will display the suggested trial weight angle in the upper right of the screen.

**Notes:**

Angles are measured in the direction you designate as your Weight Orientation i.e. with rotation or against rotation.

If you are performing a dual plane balance you should only use this option in cases where each balance plane is physically close to its sensor, and the two planes are separated from each other by a distance greater than the rotor diameter. In particular for overhung rotors this option should only be used for single plane balancing on the closest bearing and balance plane, to help with reducing the static imbalance only. The CH2 or CH4 sensor and weight reference mark must be in line with those of CH1 or CH3.

## Averages

Averaging the 'out of balance' values can increase the accuracy of your measurements, allowing the instrument to make more precise recommendations for the size and placement of balance weights. A higher number of averages produces more accurate measurements, but lengthens the recording time accordingly.

## Machine Information

Entering machine information is optional. It allows you to specify some of the physical properties of the machine being balanced.

### Rotor Weight, Diameter and Speed

Entering the rotor's weight, diameter and speed helps the instrument to calculate the appropriate size and placement of trial weights based on your machine's physical properties. The aim is to calculate a trial weight which will cause a significant change from the initial reading.

- From the Balance Setup Menu press **4** **Machine Information** and use the on-screen options to enter your values. If you need to enter a decimal point press **ALT** then **0**.
- If you need to change a measurement unit e.g. for rotor weight or diameter, return to the Balance Setup Menu and press **9** **Weight Lin Dist**. Change the units as required then press **✓**.

After you take the initial reading the instrument will display the suggested trial weight mass in the upper left of the screen.

**Note:** In Manual input mode and without a tachometer connected no suggested angle and weight will be provided by the instrument.

### Reference Mark

**Note:** This item is optional.

Reference Mark is used in conjunction with CH Position. The instrument uses this information to calculate where on the rotor you should place your trial weights after taking an initial reading.

You need to enter **both** the Reference Mark Location and the CH Position so that the instrument can calculate the trial weight angle. Refer to topic CH Position for more information.

- If the Balance Machine Menu is not already displayed press **4** **Machine Information** from the Balance Setup Menu.
- Press **3** **Reference Mark** and enter the angle from the tachometer reflective tape to your reference mark then press **✓** If these marks are aligned with each other enter zero.

After you take the initial reading the instrument will display the suggested trial weight angle in the upper right of the screen.

## Weight Orientation

Weight Orientation allows you to choose where to place balance weights on a rotor, relative to the rotor's direction of rotation.

With rotation (**WR**) means you choose a reference point then place your weights forward of that point in the direction of rotation (i.e. in the same direction as the rotor turns).

Against rotation (**AR**) means that if the rotor is turning forward then you place your weights backwards from the reference point (i.e. in the opposite direction of the rotor's rotation).

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

## Tach Trigger

Tach Trigger allows you to specify whether you are using a standard tachometer or a Keyphasor® if using a vbBalancer+ instrument.

## Weight Lin Dist

Weight Lin Dist allows you to specify the measurement units for linear speed distance, balance weights and rotor weight.

- To change the displayed units press **9** **Weight Lin Dist** then press **8** to cycle through the linear speed options or **9** to open the Weight Units Menu where you can set balance and rotor weight units.
- When you have set your units press **✓** to navigate back to the Balance Setup Menu.

## Store Units

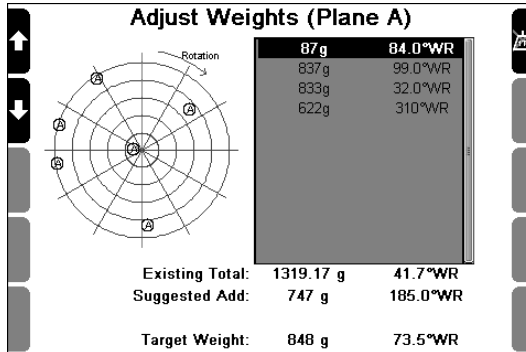
Store Units allows you to specify your preferred measurement units and overall scaling for balancing jobs.

## Combining and Splitting Trim Weights

As you continue to fine-tune a balance job, you may end up with several trim weights fixed at various angles on the balancing planes. You can combine all trim weights for an individual plane into one weight/angle solution, or split a larger trim weight into several smaller weight/angle solutions using the Adjust Weights and Split Weights calculators.

### Combining Weights (Adjust Weights)

- After taking a trim reading press **✓** to display the Trim Weight Menu (or from the Balancing Menu **7** **Balance Readings**).
- Press the left-hand arrow key beside Plane A (or Plane B) then press **4** **Adjust Weights**. The Adjust Weights Menu displays the locations and amounts of your individual trim weights, the weight vector (Existing Total), and the target weight and angle (the trim weight/angle solution you hope to achieve).



- Use the left-hand arrow keys to highlight one of the trim weights you want to remove then press **6** **Remove or Keep**. The calculator will re-calculate the suggested weight/angle accordingly. You can experiment with different remove/keep combinations by repeating this process (to add a subtracted weight back to the calculator press **6** again).
- When you are satisfied with the suggested weight calculation press **✓** to continue. To exit the menu without combining any trim weights, replace any removed weights before continuing.

### Splitting a Weight (Split Weight)

To split a larger weight into two smaller trim weights:

- After taking a trim reading press **✓** to display the Balance Weight Menu (or from the Balancing Menu **7** **Balance Readings**).

- Press the left-hand arrow key beside Plane A (or Plane B) then press **5** **Split Weight**. The Split Weight Menu displays the location and amounts of your current individual trim weight (Target Weight/Target Angle), and the resultant 'effective' weight and angle (the trim weight/angle solution) that your split configuration will achieve.

Split Weight			
Target Weight	0.01g	180.0°AR	Target Angle
First Weight	<Enter>	<Enter>	First Angle
Second Weight	<Enter>	<Enter>	Second Angle
Resultant Weight	0g	0°AR	Resultant Angle

- Press **2** **First Weight**. Enter the weight of the first split weight, then **✓**.
- Press **7** **First Angle**. Enter the proposed angle of the first weight, then **✓**.

The instrument will suggest the second trim weight placement angle and size beside **Second Weight** and **Second Angle**. The 'effective' (that is, the single-weight equivalent) of the new split weights solution will be displayed beside **Resultant Weight** and **Resultant Angle**. If you wish, you may also manually experiment with the size and position of the second weight by adjusting the second weight using **3** **Second Weight** and **8** **Second Angle**. However, bear in mind that the combination of the two weight/angle solutions should approximate the original single weight solution as displayed beside **Target Weight** and **Target Angle**.




- When you are satisfied with the suggested weight calculation press **✓** to continue.

## Adjusting Weights for a New Radius Location



Trim weight positions may be unsuitable in some cases; if, for example, an obstruction prevents you from placing a weight on a fan blade near the blade tip and you must move the weight closer to the fan hub.

For this reason a calculation tool is included in the instrument that will recalculate the required weight for various locations along the balancing radius.

To reposition trim weight along the balance radius:

- After taking a trim reading press  to display the Balance Weight Menu (or from the Balancing Menu  **Balance Readings**).
- Press  **Change Radius Plane A** (or Plane B). The 'Change Radius' screen will open.

Change Radius ( Plane A )	
Old Radius	123.1
New Radius	123.1
Old Weights: 0.01g 180.0*AR	
New Weights: 0.01g 180.0*AR	


- Press  **Old Radius** and enter the current radius position, then . The value can be in any distance unit: feet, inches, meters etc. It is only the *ratio* between the old and new radius that is being calculated.

Press **3** **New Radius** and enter a new radius position, then **✓**. The new adjusted weight suitable for this new radius will be displayed beside **New Radius** at the center of the LCD screen in the default weight values previously configured for the instrument.

## Reviewing Previous Balancing Jobs

- From the Main Menu press **1** **Balance** then **2** **Select Machine**.
- Use the left-hand arrow keys to highlight a machine. All balancing jobs associated with that machine will display in the right-hand Recordings column.
- Press the right-hand arrow key **7** select the Recordings column; a black border will appear around it indicating that you can now browse through the recordings.
- The newest balance job is highlighted at the top of the column. Press **✓** to display the selected recording or use the left-hand up/down arrow keys to select another.
- In the Balancing Menu press **8** **View and Save** to see the Balancing Report.




# Section 5: Balancing Walk-through

This walk-through guides you through the process of balancing a rotor using single and dual plane balancing. Dual plane balancing requires additional steps; these extra steps are indicated with this symbol .

You will learn to:

- Take initial imbalance measurements
- Set up and apply trial weights
- Balance the rotor using correction weights
- Perform trim balancing to further reduce the vibration
- Save and review your balancing job
- Produce balancing reports

## Step 1. Set Up a New Balance Job

- From the Main Menu press  **Balance** then press  **New Job** to clear any previous settings.
- Press  **Setup**. Use the options in the Balance Setup Menu to choose the required settings for your balancing job.

The following screen shows the settings that were selected for this walk-through.


Balance Setup			
Balance Planes	1 (360°)	WR	Weight Orientation
# Sensors	1		
# Averages	1	Standard	Tach Type
Machine Information	(optional)	g/lb m	Weight Lin Dist
Fmax	Automatic	mm rms	Store Units

## Step 2. Take an Initial Reading

- **Stop the machine.**
- Attach the sensor to the bearing housing closest to the rotor. For best results attach it in the radial direction in which the machine is most flexible (and vibrates the most).



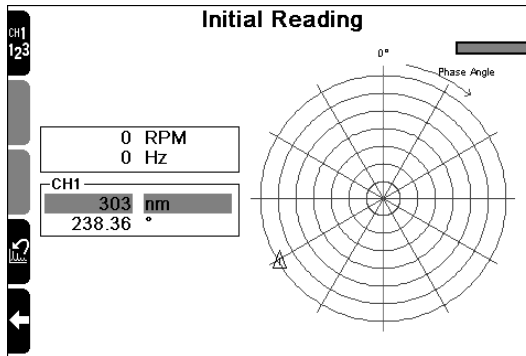
Attach a sensor to each of the bearings supporting the rotor. It is not important how the sensors are paired or which sensor is attached to which end.


- Set up the tachometer (see Setting up the Tachometer on page 33).
- **Start the machine** and let the rotor settle to its normal operating speed. Since the vibration level depends on the speed of the rotor it is important to take all readings while the rotor is operating at its normal speed.
- From the Balance Setup Menu press  to take the initial reading. The initial reading measures the 'out of balance' level of the rotor.

After a few seconds, the instrument displays the speed of the rotor in RPM and Hz, the vibration level due to the imbalance (i.e. amplitude at 1X the rotor speed), and the phase angle of the vibration.



For dual plane balancing two sets of values will display.



- Wait for the readings to stabilize then press .

## Step 3. Take a Trial Reading

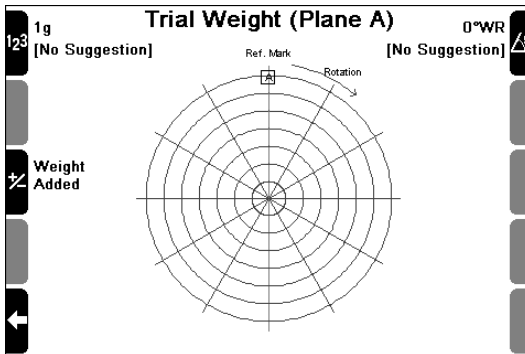
- **Stop the machine.**
- Establish a reference mark on the balancing plane. This will be used to measure the angular position of the trial weight and the final balance weights. The reference mark can be at **any** position around the balancing plane. It does not need to be referenced to the tachometer reflective tape position.



In dual plane balancing, establish a reference mark on Plane B also. It does not need to correspond with the Plane A reference mark.

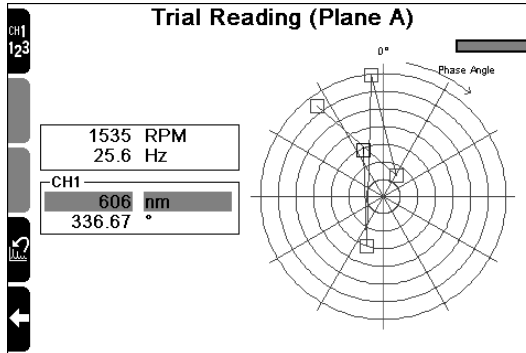
- Attach a trial weight to the balancing plane. It is important that the trial weight is not too large, as this may damage machine bearings, and not too small as its effect will be imperceptible. Your trial weight must be of sufficient mass to change the imbalance by approximately 30% in amplitude or 30% in phase (these figures are the industry norm). This will allow the instrument to perform its calculations accurately.

- The trial weight position should be near the rim of the rotor but can be at any angular position. Starting at the reference mark, measure the angular position in the direction you specified for the Weight Orientation. This will be either WR (with rotation) or AR (against rotation).
- In the Trial Weight Menu press **1** and enter the value for your trial weight. If you need to enter a decimal point press **ALT** then **0**.
- Press **✓** to return to the Trial Weight Menu then press **6** and enter the position of your trial weight in relation to the reference mark.
- Press **✓** to return to the Trial Weight Menu. Press **3** to specify whether you are adding or removing (drilling out) weight.

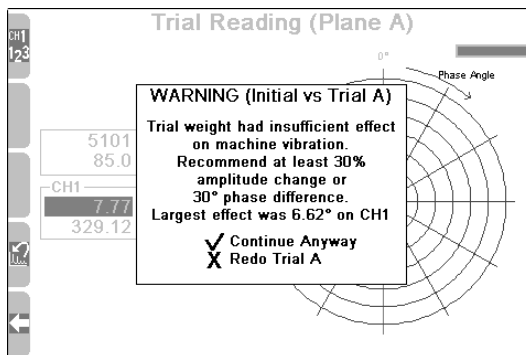


- Replace safety covers, **start the machine again**, and let the rotor settle to its normal operating speed.

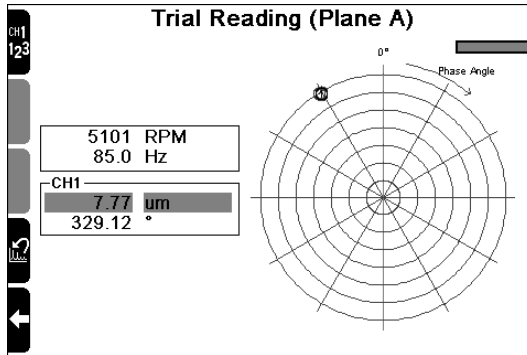
- Press  to take a reading of the imbalance with the trial weight added. After a few seconds, the instrument displays the speed of the rotor in RPM and Hz, the vibration level with the trial weight added.



- Wait for the readings to stabilize then press . If the trial weight was not of sufficient mass to affect the imbalance the instrument will display a warning prompt. You can redo the trial reading several times if required or continue with balancing.



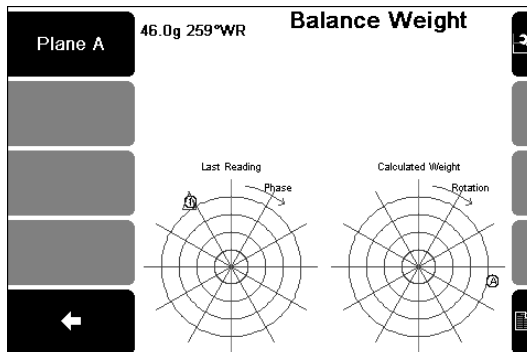
- The instrument then displays the prompt 'Will the Trial Weight be removed now?' Press the appropriate key. You can redo the trial reading several times if required or continue with balancing. Here we have added trial weights twice more to obtain a new trial reading.



Perform the same procedure for Plane B (attach a trial weight, enter its position and specify whether weight is being added or drilled out). If you are removing trial weights the Plane A trial weight **must** be removed before performing the Plane B trial reading.

## Step 4. Balance the Rotor

With Initial and Trial Readings completed the Balance Weight Menu will now display. The instrument displays the weight required to correct the initial imbalance and the angular position at which it must be attached.




- **Stop the machine.** If you are removing trial weights as you go, do this now before attaching your correction weight.

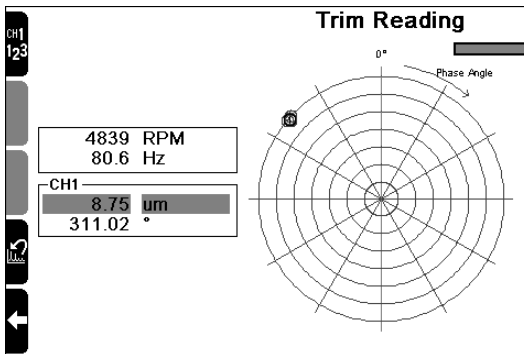
- Attach or remove the recommended correction weight as indicated by the instrument then proceed to Trim Balance.




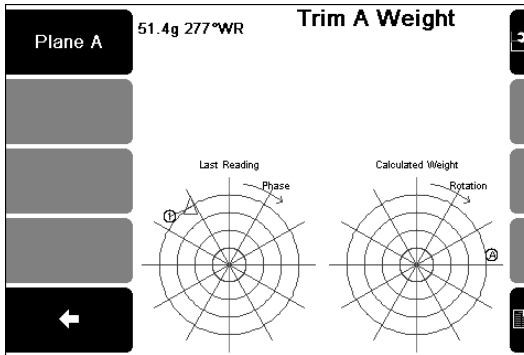
For dual plane balancing two sets of values will display.

## Step 5. Perform Trim Balancing

- Replace safety covers, **start the machine again** and let the rotor settle to its normal operating speed.
- Press  to take a trim reading. After a few seconds the instrument displays the vibration level with the imbalance corrected.



- Press  to accept this measurement. The instrument will now display the details of additional weight adjustments required to trim balance the rotor (i.e. to further reduce the level of vibration/imbalance). You can end balancing at this point or continue with another reposition of trim balance weights, as indicated, to improve on the balance level. Repeat trim balancing until you are satisfied with the results.



## Step 6. Viewing and Saving Balancing Jobs

- This step is optional. To view the Balancing Report Menu press **0**. The screen displays the results of your initial and trial readings, the balance reading and any trim balances.

Balancing Report		
	Plane A (g °WR)	CH1 (um rms)
Initial	---	7.97 327°
Trial-A	1 @ 8°	8.00 328°
Bal.	45.96 @ 259°	8.91 309°
Resid.	51.41 @ 277°	---

### Saving the balance job

- From the Balancing Report Menu press **0** **Save Balance Job**. Select or create a machine to save this balancing job to then press **✓**.

**Note:** You can save multiple balance jobs to a single machine to create a 'history' of balancing.

---

## Section 6: Analyzing Measurements Onsite

This section describes how to take measurements and perform onsite analysis.

You will learn to:

- Take a measurement
- Change how a measurement is displayed
- Perform analysis using cursors and zooming
- Set a measurement's RPM
- Store a measurement

### Tips for Taking Measurements

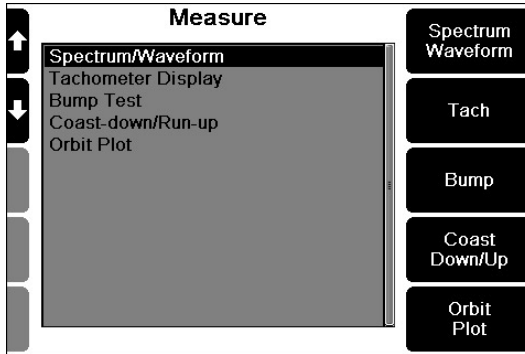
- You should always take measurements using the machine operating mode that is typical for that machine (using a typical load and running speed). This will ensure that the loads on the components, such as bearings, are the same as those that define their wear. For multi-operating mode machines it is best to take measurements when the loads on the bearings are at a maximum and to take all future measurements in the same mode.
- When taking the measurement, try not to lean on the machine and do not put heavy objects (e.g. heavy tool boxes) on it since this will change the vibratory behavior of the machine.
- If there are machines operating nearby that might affect the vibration of the machine you are measuring, stop those surrounding machines if possible.



- In addition to the measurements that you will be taking, if possible, stop and listen to the sound of the machine; look for loose bolts and oil leaks; take note of any machine parts that are vibrating visibly; feel for hot bearings and manually ‘feel’ the vibration (e.g. with a screwdriver) to look for symptoms that might later aid vibration analysis. This should be done only if it is safe to do so.
- If you have a stroboscope (not included in the instrument kit) you may wish to use it to ‘freeze’ rotating shafts, belts, couplings etc to observe their operating shapes and relative speeds in order to look for symptoms that might later aid vibration analysis.

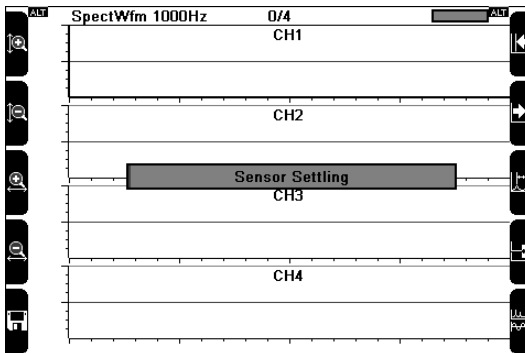
## Walk-through: Taking Measurements

Onsite analysis involves watching a machine's vibration on-screen as it occurs, and analyzing the measurement on the instrument. This method of measuring allows you to take a quick look at a machine's vibration patterns without storing the measurement. (You can choose to save the measurement at any time by creating a machine to save it to, or by selecting an existing machine definition stored in the instrument.)

- Attach the sensor (and tachometer if you are taking rotor speed and phase angle measurements). Now start the machine and allow it to operate under its normal load and running speed.
- From the Main Menu press **2** **Measure Vibration**.



- Select your measurement type by using the arrow keys to move the selection bar then press  or by pressing the quick access buttons to the right of the screen.
- The measurement default settings are displayed on-screen. You can change any of these defaults before taking a measurement. See sub-heading 'Changing the default settings' at the end of this topic.
- To start the measurement press . The instrument and sensor will take a short time to settle before measuring begins. Measurements are taken in 'free run' mode, which means that the signal continually updates on-screen until you stop the measurement.



- To stop the measurement press **✓**. You can now analyze the measurement on-screen, including displaying the amplitude of spectral peaks and identifying harmonics (see Analyzing Measurements).

OR

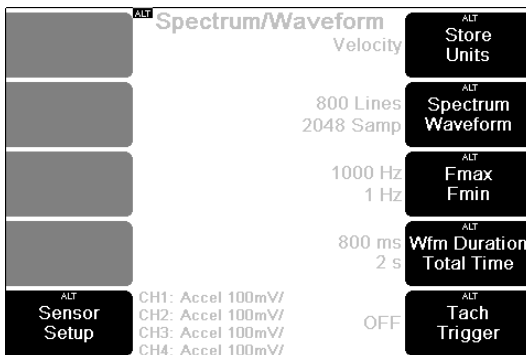
- To stop viewing the measurement and exit without saving press **X**.

OR

- To save the measurement press **5** and select an existing machine location or create a new one (see Saving Measurements on page 75).

### Changing the default settings

- To change any of the settings shown on the right of the screen, press the keys beside the on-screen icons.
- To change any of the settings shown at the bottom of the screen press **ALT** then press the keys beside the on-screen icons. Pressing keys causes the display to cycle through the available options or opens a sub-menu where you can enter a value or choose a value from a list.



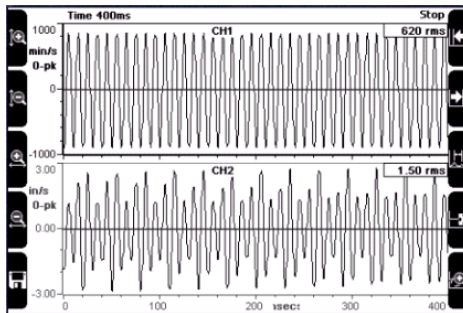
Pressing **ALT** lets you change the measurement setup

- If a sub-menu opens, make your changes then press **✓**. This will apply your settings and return you to the previous menu where you can change further settings if required.

- To select a different sensor press **ALT** then press **5** **Sensor Setup**. Press the Change Sensor key opposite your chosen measuring channel then use the left-hand arrow keys to highlight a sensor and **✓** to select it. Press the left-hand arrow key beside your chosen channel to enable it then press **✓** twice to begin measuring.

## Working with Charts

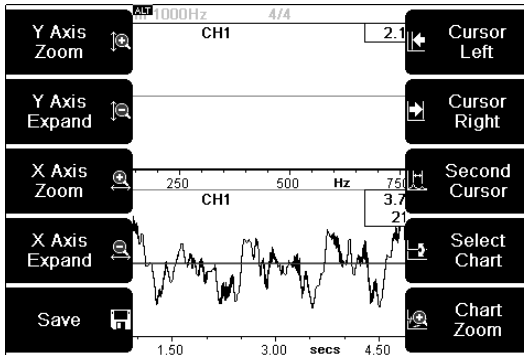
You can display a separate on-screen chart for each measurement channel. This allows you to watch multiple 'live' measurements at the same time, freeze all measurements on-screen and compare them together, and also toggle between the charts so that you can view them one at a time.



*Viewing two waveforms simultaneously*

## Analyzing Measurements

- To halt a measurement so that you can analyze it press **✓**. The overall vibration value will display at the top right of the screen.
- Press **?** to display hint labels for analysis options such as zooming and displaying cursors.



Pressing **?** displays analysis options

## Using Cursors

Cursors are a valuable tool for analyzing your data. You can use them to show the amplitude and frequency of a peak, identify harmonics, and show the frequency difference between two peaks.

### Placing a cursor on the chart

- Press **6** or **7** repeatedly to activate a cursor and move it across the screen. To move the cursor rapidly from peak to peak within a displayed waveform recording press and hold the key.

### Placing a second cursor on the chart

- Press **8** **Second Cursor**. The second cursor will not be immediately visible as it will be placed directly behind the first cursor (the new cursor's values will appear at the top right of the screen).
- Press **6** or **7** repeatedly to move the cursor to either side so that it becomes visible.

### Toggling the active cursor

- Press **8** **Second Cursor** to toggle between the two cursors. The selected cursor will be darker with a dashed line, while the inactive cursor will be a lighter gray with a finely dotted line.

## Clearing cursors

- Press **ALT** then **8** **Clear Cursors** to remove all cursors and harmonics.

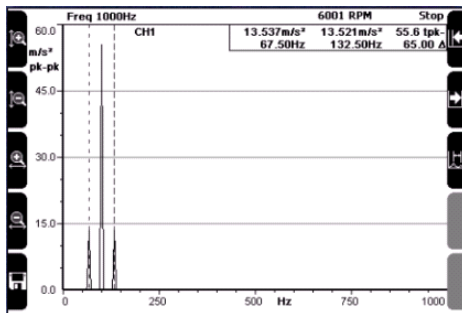
## Displaying the amplitude/frequency of a peak

- Press **6** or **7** repeatedly to activate a cursor and move it across the screen. The frequency and amplitude values indicated by the cursor will display at the top right of the screen. A horizontal 'crosshair' across the active cursor will indicate the amplitude of the selected peak at the cursor location.

## Displaying the frequency or time difference between peaks

- Press **6** or **7** repeatedly to activate a cursor and move it to the first peak.
- Press **8** **Second Cursor** to add a new cursor to the display and press **6** or **7** repeatedly to move it to the second peak.

Both cursors' values appear at the top right of the screen. The delta symbol  $\Delta$  will appear on the far right of the screen. The value beside the delta displays the frequency or time difference between the two peaks.



The delta indicates the frequency/amplitude difference of two peaks



## Displaying harmonics

- Press **ALT** then press **6** **Harmonics Sidebands**. Repeating this keypad sequence will cycle between three cursor types: harmonic cursors, harmonic and sideband cursors, and normal cursors. The cursor type selected will be identified by a brief onscreen message.
- Press **6** or **7** repeatedly to move the cursor over different peaks.

Additional cursors will display at frequency or time values that are whole-number multiples of the frequency or time value indicated by the main cursor.

## Turning harmonics off

- Press **ALT** then press **8** **Clear Cursors** to remove all harmonics and sidebands.

## Zooming

Zooming allows you to take a closer look at a specific area of interest on a chart.

### Chart zoom and expansion options

- Magnifying glass icons on the left of the screen indicate that zooming options are available. (If the magnifying glass icons are not visible press **ALT** toggle them on.) Press **?** to display hint labels for zooming and expansion options.

### Zooming horizontally (across the chart)

- To expand the peaks of a spectrum or waveform use the right-hand arrow keys to move the cursor to the position of interest and press **3** **X Axis Zoom** repeatedly to zoom in on the cursor position by a factor of two per key press. The more spectral lines or waveform sample points used, the more times you can zoom.

### Zooming vertically and horizontally

- To see low amplitude peaks more clearly move the cursor to the position of interest and press **1** **Y Axis Zoom** to zoom in by a factor of two per key press.
- Press **3** **X Axis Zoom** to expand the frequencies on either side of the cursor.

### Zooming out

- Press **4** **X Axis Expand** repeatedly to zoom out horizontally and **2** to zoom out vertically.

## Viewing Multiple Charts

When you measure more than one channel simultaneously, or display both a spectrum and a waveform, each chart will display on-screen. You can view the measurements on all charts at the same time (waveform or spectra only when viewing three or more measurements simultaneously) or select a specific chart to work with. When using analysis options such as zooming, these will only be applied to the selected chart.

### Selecting a chart

- With the charts displayed press **?** (you don't have to display the hint labels but this will help).
- Press **9** **Select Chart**. The axes of the selected chart will become thicker and darker to indicate that this chart has the focus. Press **9** repeatedly to toggle which chart you wish to work with.

### Displaying a single chart

- To make one chart fill the entire screen select the chart as described in the previous instructions then press **0** **Chart Zoom**.
- To re-display all charts press **0** again.

## Changing Chart View

You can toggle between waveform and spectrum recordings, and set the default layout of multi-channel and single-channel onscreen measurements using the Change View and Multi Chart Layout functions.

**Note:** The following functions are only available when viewing multi-channel (two or more) and multi-domain (spectrum+waveform) measurements.

### Selecting a chart layout

- With the charts displayed press **?** to display hint labels.
- Press **0** **Change View** to alter the currently displayed chart type. Press repeatedly to toggle between waveform or spectrum displays for up to four channels, and spectrum+waveform to view both measurement types onscreen simultaneously for individual channels.

### Changing how multi-chart layouts are displayed

- With the charts displayed press **?** to display hint labels.
- Press **ALT** then press **0** **Chart Data Change** to open the Multi Chart Layout screen.
- Press **5** to choose which channels will be displayed in your Multi Chart Layout.
- Press **1** or **2** to pick a layout from those listed. For single channel displays you may choose waveform, spectrum or spectrum+waveform. For multi-domain measurements using three or more channels and with all channels set to display simultaneously ('Show All Channels' in the previous step), you may only select waveform or spectrum for simultaneous display, not both.

## Setting the Y Axis (Amplitude) Scale

toggling the left axis scale between Linear, Log and dB will increase or decrease the amplitude of displayed peaks allowing you to see either the bigger picture or a more detailed view of the data. The Linear scale is suitable for most cases. Log scaling (base 10) is more useful for displaying vibration with both very large and very small amplitudes.

- With the spectrum measurement displayed on-screen (either still measuring or stopped) and highlighted press **ALT** then **1** **Y Axis Log** to set the Y axis (amplitude) scaling options.
- Press **1** **Linear Log dB** repeatedly to toggle between Linear, Log, and dB scaling (vdB and adB scaling are only available when measuring velocity and acceleration respectively).
- Press **2** **Y Axis Max**. This is the highest amplitude value that will be displayed on-screen. Use the arrow keys to highlight a value then press **✓** to select.
- Press **3** **Y Axis Range** repeatedly to toggle the Y Axis range. This selects the lowest amplitude value that will be displayed on-screen relative to your chosen Max Value.
- When you have finished press **✓** to return to the measurement screen.

### Fixed Y Axis scale options

Setting a Max dB Value sets the highest value that the amplitude axis can display, so if a peak goes above this value while you are measuring you will not see the top of the peak. When using *Linear* scaling you have two extra display options.

**Automatic:** This allows the instrument to auto-scale the left axis to accommodate the highest and lowest peaks.

**Current:** This fixes the Y axis to whatever amplitude is currently displaying, regardless of how large or small the peaks become.

## Amplitude Display Units

Your chosen Store Units (acceleration, velocity etc) determine which amplitude scaling options are available. The vdB scale is only available if you are taking velocity measurements and adB is only available if you are taking acceleration measurements. Linear and Log scaling are available for all measurement types. Choose from the following amplitude display units:

Store Units	Max dB Value Linear Scale	Max dB Value Log Scale
Acceleration	m/s <sup>2</sup> , mm/s <sup>2</sup>	m/s <sup>2</sup> , mm/s <sup>2</sup>
Velocity	mm/s, μm/s	mm/s, μm/s
Displacement	mil, mm, μm	mm, μm

Store Units	Y Axis Fixed Linear Scale	Y Axis Fixed Log Scale
Acceleration	automatic, current, mm/s <sup>2</sup>	m/s <sup>2</sup> , mm/s <sup>2</sup>
Velocity	automatic, current, μm/s	mm/s, μm/s
Displacement	automatic, current, m	mm, μm

### vdB

The vibration velocity level vdB is defined as 20 times the logarithmic of the ratio of the RMS velocity level to a reference velocity value (the vdB reference). The value 1e-6 mm/s is an abbreviation for  $1 \times 10^{-6}$  mm/s and is the SI reference level. The value 1e-5 mm/s is the reference level used by the US Navy and many American industries.

### adB

The vibration acceleration level adB (US) is defined as 20 times the logarithm of the ratio of the RMS acceleration level to 1 μg RMS.

The SI version of adB is less commonly used, and has a reference value of 1 μm/s<sup>2</sup>.

## Setting the RPM

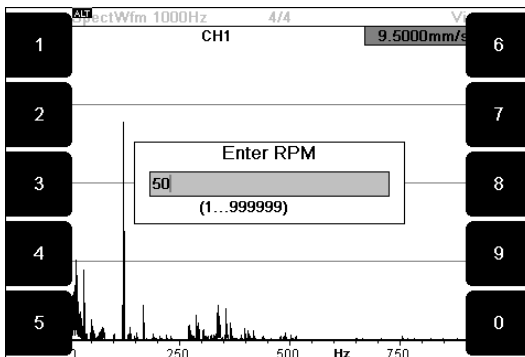
Setting the 1X RPM allows you to view the chart in orders (for spectra) or revs (for waveforms). You can enter the RPM manually (if you know it), or set the RPM from a spectral 1X peak.

### Entering the RPM manually

- With a measurement displayed press **ALT** then **7** **Set RPM**.
- Enter a value using the number keys then press **✓**.

### Entering the RPM using the 1X peak

- Press **6** or **7** to move the cursor to the 1X peak.
- Press **ALT** then **7** **Set RPM**. The frequency of your selected peak will be displayed.



- Press **✓** to save this frequency as the RPM value.

### Note:

If a tachometer is connected to the instrument, the instrument will use the RPM from this rather than any entered value.

## Viewing Orders

When orders are displayed, the frequency axis of a spectral chart is labeled in orders of running speed instead of in Hz or CPM. This allows you to see how closely spectral peaks correspond to the

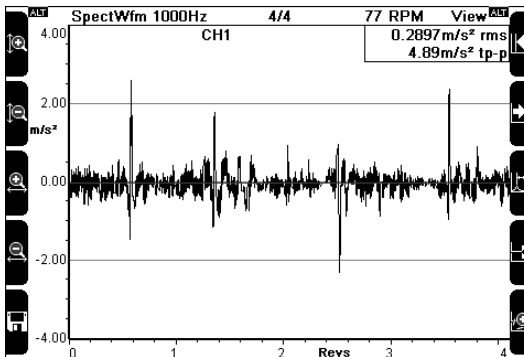
running speed of the machine. In addition, you can move a cursor to a peak of interest - the exact number of orders at that frequency will appear at the top-right of the screen.

- With a spectral chart displayed, set the RPM as described in the previous topic and press **ALT** then **3** **X Axis Orders**.
- To de-activate orders repeat the previous step.

## Viewing Revolutions

When Revs are displayed, the time axis of a waveform chart is labeled in revolutions of running speed instead of your regular measurement units.

- With the waveform chart displayed, set the RPM as described previously. The bottom axis will update to display revs.



*Waveform chart displaying Revs on the X axis*

## Saving Measurements

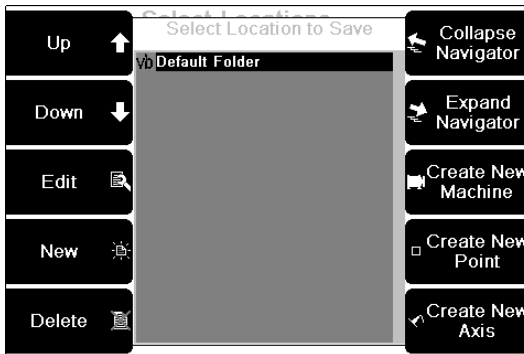
- Stop the measurement by pressing **✓** then press **5** **Save**. You now need to select a machine, point and location to save the measurement to or create these now.

## Selecting an existing machine

- Press **Save to..** (keys **6** to **9** depending on the number of channels used for the measurement), then press **1** or **2** to scroll up and down and press **7** **Expand Navigator** repeatedly to expand out a machine so that its points and locations become visible. Press **✓** to save the recording to your chosen location.

## Creating a new machine

- Press **Save to..** (keys **6** to **9** depending on the number of channels used for the measurement), then press **8** **Create New Machine**. The following image shows the machine creation icons after pressing **?** to display hint labels



*Creating a new machine to save the measurement to*

- Enter a name for this machine then press **✓**.
- Repeat this process to create a point **□** then press **✓** and use the arrow keys to select a location. Press **✓** until you see the message 'Data Saved'.

# Section 7: Setting Measurement Options

This section describes the different parameters used to take measurements and how to apply them.

You will learn:

- What the various parameters are for spectra, waveforms and other measurement types
- How to create parameter sets for taking measurements
- What measurement units and overall scaling options are available
- How to assign sensors to channels

## Setting Measurement Units and Spectrum Scaling

You can choose the standard US or SI units, or choose your own preferences. The table below summarizes the options.

- To set a preference, from the Main Menu press **0** **Options** then press **2** **Measuring Units**.
- Press **1** repeatedly to toggle which unit set is displayed. To set your own preferences select Custom then press the keys beside the first option you wish to change.
- Most on-screen options will open a sub-menu; press the keys repeatedly to cycle through the various options. When you have finished press **✓** to save and return to the Measurement Units Menu.

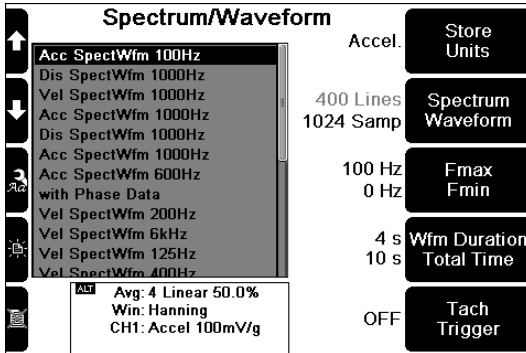
	Units	Spectrum Scaling	Time Waveform Scaling
<b>Accel</b>	g, m/s <sup>2</sup>	RMS, 0-pk, pk-pk	RMS, 0-pk, pk-pk
<b>Veloc</b>	mm/s, in/s	As above	As above
<b>Disp</b>	mm, μm, mil	As above	As above

Unit Set	SI	US	Custom
<b>Frequency</b>	Hz	CPM	Hz, CPM
<b>vdB Units</b>	vdB SI (1e-6 mm/s)	vdB US (1e-5 mm/s)	vdB US, vdB SI
<b>adB Units</b>	adB SI (1 μm/s <sup>2</sup> )	adB US (1 μg)	adB US, adB SI
<b>Linear Speed Distance</b>	mm	in	mm, in
<b>Weight</b>	g, kg	lb, oz	lb, oz, tons, kg, g

Balancing Units			
Quantity	Acceleration	Velocity	Displacement
<b>Units</b>	g	in/s, mm/s	mm, μm, mil
<b>Scaling</b>	RMS, 0-pk, pk-pk		

## Setting Measurement Parameters

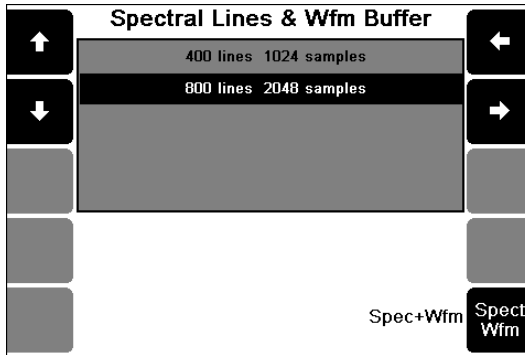
When you select a measurement type e.g. Spectrum Waveform from the Measure Menu the default parameters display on-screen.



*Spectrum measurement setup showing default parameters*

### Example:

- From the Main Menu press **2** **Measure Vibration** then press **6** **Spectrum Waveform**.
- Press **?** to display hint labels then press **4** **Create New Paramset**.
- The default parameters for a spectrum measurement are displayed. To change a parameter value press the key beside the value's on-screen label. This will cause the parameter to cycle through the available options, or it will open a sub-menu where you enter a value via the keypad or select a value from a list. If you have opened a sub-menu save your changes by pressing **✓**.



*Spectral lines sub-menu*

## Creating Your Own Parameter Sets

To create a new parameter set that you can store and reuse, do the following:

1. Open the menu for the measurement type you want to create (from the Main Menu press **2** **Measure Vibration** then use the arrow keys to select the required measurement type and press **✓** to select it).
2. Press **?** to display hint labels then press **4** **Create New Paramset** to create a new copy of the default parameter set.
3. Press **3** **Edit Name** and enter a description for this parameter set then press **✓**.
4. The new parameter set will be highlighted to indicate that it is selected. Press the keys beside the on-screen labels to set your values as described in the previous topic.

### Example: Creating a custom spectrum parameter set


- From the Main Menu press **2** **Measure Vibration** then press **6** **Spectrum Waveform**.
- Press **4** **Create New Paramset**.

- Press **3** **Edit Name** and enter a name for this parameter set then press **✓**.
- Change Store Units to Acceleration. Press **6** and select the Accel then press **✓**.
- Set the Fmax to 1500 CPM. Press **8** **Fmax Fmin** then press **4** to set the RPM to 10 x the machine running speed.
- Set the number of Spectral Lines to 800. Press **7** **Spectrum Waveform** and use the arrow keys to highlight '800 lines 2048 samples' then press **✓**.
- Set the Average Overlap to 62.5%. Press **ALT** to display Averaging and Window options and press **3** **Average Overlap** repeatedly to cycle through the values, then press **✓**.
- Your new parameter set is now ready to use. If you have already defined a sensor and enabled a channel you can now take a measurement by pressing **✓**. Assigning sensors to channels is explained in the next topic.


## Assigning Sensors to Channels

You must specify which sensor is assigned to each channel. When you take a measurement the instrument will know which sensor is being used and will offer you the appropriate measurement unit and overall scaling options for on-screen display. If you unplug a sensor in order to take a different type of measurement e.g. swapping an accelerometer for a current sensor, you will need to assign this new sensor to the channel.

- From the Main Menu press **0** **Options**.

- Press **5** **Sensor Setup** then press Change Sensor opposite your chosen measuring channel. (If this is new sensor that has not yet been defined in the instrument you will need to create a sensor definition before you can assign it to a channel. See Defining and Editing Sensors on page 107.)
- Use the arrow keys to highlight a sensor then press  to assign it to your channel.

Sensors		
Name	Type	Sensitivity Level
>Accel 100mV/g	Accel.	100mV / g

- To enable the channel for measuring, press the left-hand key beside your chosen channel. The text will change from '---' to 'Enabled' to indicate that this channel can now be used to take measurements.
- Press  twice to return to the Main Menu.

### Multi-channel measurements

To take simultaneous measurements, follow the procedure described previously and enable as many channels as required.


## Explaining Spectrum Parameters

### Fmax

The Fmax is the maximum frequency **displayed** on the spectrum i.e. the frequency range, starting from zero, over which vibration amplitudes are displayed.

In general, the higher the operating speed of the machine, the higher the  $F_{max}$  needs to be to capture all crucial information. For vibration involving fingered elements such as gear teeth, fan blades, pump vanes, and bearing elements, an  $F_{max}$  equal to 3 times the number of fingers multiplied by the operating speed is usually sufficient. For vibration not involving fingered elements, an  $F_{max}$  equal to 40 times the operating speed is usually sufficient.

You can specify the  $F_{max}$  of a measurement either as an exact value or as a multiple (order) of a machine's running speed.

- Select your measurement type then press **8**  **$F_{max}$   $F_{min}$** . The options labeled 40 X and 10 X represent orders of running speed. The option ? X allows you to enter your own number of orders.
- Press one of the orders keys and enter your machine's default RPM value.
- Press  twice to return to the measurement setup.

When you take the measurement the resulting display will use an  $F_{max}$  with the specified number of orders (the value will be rounded up to the closest  $F_{max}$  if an exact match is not available).

## Spectral Lines

The resolution of the spectrum increases with the number of spectral lines used i.e. the more spectral lines the more information the spectrum contains. However, the more spectral lines used, the longer the measurement takes. Use many spectral lines only when required e.g. when you need to distinguish between two closely-spaced vibration frequencies or when the  $F_{max}$  is very large. For coast-down or run-up measurements we recommend a resolution of 400 lines.

## $F_{min}$

The purpose of the  $F_{min}$  setting is to eliminate the 'ski-slope' effect from the low frequency end of the spectra. All spectral lines **below** the  $F_{min}$  value will be set to zero and will **not** be included in the overall RMS calculation.

---

## Tach Trigger

When you select Tach Trigger, measuring begins only when a tachometer pulse is detected. If Tach Trigger is set to OFF the instrument will begin measuring as soon as the settling time has elapsed.

## Averaging

When measuring vibration, several spectra are usually measured and averaged to produce an average vibration chart. The averaging process minimizes the effect of random variations or noise spikes that are inherent in vibration signals. Averaging is applied to amplitude values, not to the frequency range.

## Average Overlap

Overlapping is a means of collecting and displaying data more quickly. As vibration measurements are collected a percentage of the new data is combined (overlapped) with each subsequent measurement. The higher the overlap percentage, the less newly acquired data is needed to generate a spectrum, and thus the faster the spectrum can be displayed. An overlap percentage of 50% is ideal for most cases.

## Explaining Waveform Parameters

### Equivalent Fmax

This allows you to control the waveform sampling rate by expressing it in terms of the maximum frequency of interest. For example, if you want a waveform with frequency content (Equivalent Fmax) up to 1 kHz, the instrument will automatically sample at 2.56 kHz. Changing the Eq. Fmax directly affects the sampling rate, so it has an inverse effect on the duration of the waveform.

### Number of Samples

The resolution of the waveform increases with the number of samples used i.e. the more samples, the more information the waveform contains. However, the more samples in a waveform, the more memory is used up to store the waveform.

**Tip:** An easy way to select the number of samples and duration is to let the instrument set them for you. Set the Equivalent Fmax so that it covers your required frequency range; the instrument will select the maximum number of samples and duration that can be used with this Fmax. You can then adjust these values as required.

## Duration

The Duration of a waveform is its recording time. The duration value depends on the number of samples selected; increasing the number of samples increases the duration.

# Section 8: Measurement Types and Their Uses

This section describes how to setup and take different measurements types.

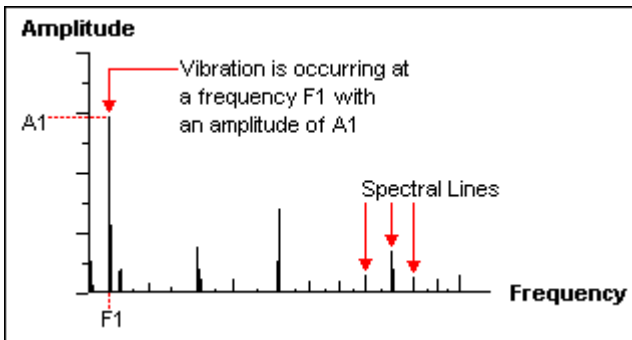
You will learn:

- How to take different types of measurements
- The uses of different measurement types

## Spectrum

A vibration spectrum is a chart of vibration amplitude versus vibration frequency. The vibration spectrum of a machine component shows the frequencies at which the component is vibrating and the amplitude of vibration at each of these frequencies.

Spectra consist of discrete spectral lines displayed at fixed frequency intervals. The height of each spectral line represents the amplitude of vibration at that frequency. The more spectral lines in a spectrum, the higher the resolution of the spectrum (but more memory is used).



*A simplified illustration of a discrete vibration spectrum*

The key parameters you need to set are the number of spectral lines and the  $F_{max}$  to ensure that all crucial information is captured.

- From the Main Menu press **2** **Measure Vibration** then press **6** **Spectrum Waveform**.
- Use the left-hand arrow keys to select a parameter set or create a new one by pressing **4** and setting the parameters as required.
- Press **✓** to begin measuring.

## Waveform

Waveforms show how vibration levels change with time. A vibration waveform chart represents a series of equally spaced discrete sample points connected by straight lines. The chart shows the vibration level (amplitude) at each time interval during the measurement period. The more sample points in a spectrum the higher the resolution of the waveform (but the more memory used).

The key parameters you need to set are the duration and number of samples.

The duration determines the equivalent Fmax value.

- From the Main Menu press **2** **Measure Vibration** then press **6** **Spectrum Waveform**.
- Use the left-hand arrow keys to select a parameter set or create a new one by pressing **4** and setting the parameters as required.
- Press **✓** to begin measuring.

## Tachometer Display

Tachometer Display shows an updating readout of the machine speed.

- Connect the tachometer that will be used to measure the RPM.

- From the Main Menu press **2** **Measure Vibration** then press **7** **Tach**.
- Select the Standard tachometer or Keyphasor® sensor by pressing **0** **Tach Type**. This option is only available if using a vbBalancer+ instrument.

## Bump Test

**Note:** This feature is not available on the vbBalancer instrument model.

The bump test is a useful vibration analysis technique to help identify resonance frequencies in a machine's structure. It requires 'bumping' (i.e. hitting) the machine structure when the machine is stopped, while taking a peak hold measurement. Careful selection of the mallet or hammer is required along with the strength and direction of the bump to ensure that suitable frequencies are injected into the structure without causing damage.

- From the Main Menu press **2** **Measure Vibration** then press **8** **Bump**.
- Use the left-hand arrow keys to select a parameter set or press **4** to create a new one and set the parameters as required.
- Press **✓** to begin sampling and 'bump' the machine with a hammer. Repeat several times.

Bump test measurements are taken in free run mode and use peak hold averaging. The instrument will take continuous samples and update the peak value for each spectral line whenever a line exceeds its previous value.

## Coast-down/Run up

**Note:** This feature is not available on the vbBalancer instrument model.

Coast-down and run-up measuring involves taking a series of recordings with a short delay between them. This technique can be used to study the resonance behavior of a machine as its speed gradually increases during power-up, or decreases during coast-down.

- From the Main Menu press **2** **Measure Vibration** then press **9** **Coast Down/Up**.
- Use the left-hand arrow keys to select a parameter set or press **4** to create a new one and set the parameters as required.
- Press **✓** and select the machine location to save measurements to, then press **✓** again to begin measuring. After the first spectrum has been recorded switch off the machine, or begin ramping its speed up or down.
- Once the machine has stopped rotating, or its speed has been fully adjusted, press **X** to stop measuring and return to the Coast-down/Run-up Menu.

The measurement location will contain a large number of measurements.

### Recommendations

We recommend using a tachometer to obtain the RPM reading for each measurement as this aids interpretation.

You can set the Recording Interval as either a time interval between recordings, or as a change in machine RPM. We suggest using the latter, with the RPM Difference set to machine speed / 20. This will result in approximately 20 recordings being taken during a complete coast-down or run-up.

A large number of recordings are taken during a coast-down or run-up. If you intend to repeat the process several times on a machine we recommend you save each set of recordings to a separate location so that they can be easily distinguished.

## Orbit Plot

**Note:** This feature is not available on the vbBalancer instrument model.

Orbit plots are used to detect abnormal movements of the shaft in the bearing, indicating unbalance, misalignment or rub against a drive casing. Two sensors are used, placed 90 degrees apart from one another, nominally positioned vertically and horizontally, respectively.

The orbit's X-Y plot shows the amplitudes from these two orthogonal vibration measurements plotted against each other. By plotting the shaft's simultaneous vertical and horizontal vibration the motion of the center of mass of a shaft can be calculated.

Unbalanced or misaligned machinery may exhibit as 'circular orbits', 'figure eights', 'leaning orbits' or 'flat orbits', while rub or looseness may be displayed as indents around the circumference of the orbit plot, or small loops around the larger plot orbit. Severe rub or looseness may produce highly random orbit plots.

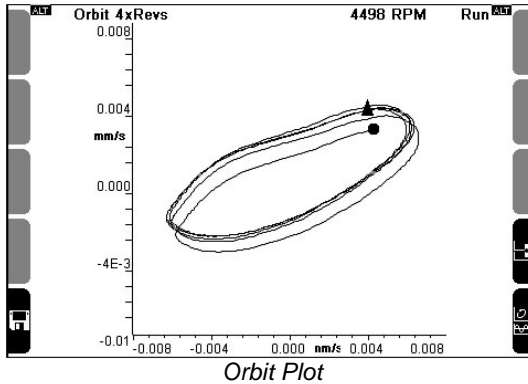
To take an Orbit Plot measurement:

- From the Main Menu press **2** **Measure Vibration** then use the left-hand arrow keys to highlight **Orbit Plot** then press **✓**.
- Use the left-hand arrow keys to select a parameter set or press **4** to create a new one and set the parameters as required.

- Configure your sensors by pressing **ALT** then **5** **Sensor Setup**. Enable two sensors then press **✓**. Ideally the sensors used to take the measurements should be displacement probes as we are measuring the physical movement of the shaft. If required, you can also take the measurements with accelerometers if no displacement probes are available, but be aware that these measure the movement of the bearing housing, not the shaft.

**Note:** The lower of the two channels activated is always set as the vertical axis sensor. For example, activating channels 2 and 4 would result in channel 2 acting as the vertical sensor input.

- Press **7** **Number of Samples** and select an appropriate number of samples. 1024 is recommended.
- Press **9** **Wfm Duration Total Time** and select a measurement duration. 4-6 revolutions is recommended (**9** **? rev** followed by the number of revolutions) or an equivalent duration in seconds/milliseconds.
- Press **0** **Tach Trigger** repeatedly to select the required tach mode. If **OFF** is selected you will be prompted to manually enter the machine's RPM before the measurement begins.
- Press **✓** to begin sampling. The sensors will settle and the orbit plot will be displayed. Press the tick again once the plot has stabilized to display a single waveform orbit measurement. Note that filtering is not supported on the instrument: you must purchase the Ascent software for advanced analysis.



- Press **5** **Save** to save the two waveform measurements used to generate the orbit plot. You must specify the vertical and horizontal channels in order to correctly view the orbit plot in the Ascent software.


**Note:** The circle icon indicates the start position of the waveform and the triangle the end. Press **0** **Change View** to toggle between orbit plot and waveform views.

## Taking Multi-channel Simultaneous Measurements


Taking a multi-channel measurement uses the same process as taking a single channel measurement. The only difference is that you must enable more than one channel, and save each measurement separately. You do not have to save each channel's measurements as you can selectively choose which ones to keep, e.g. you can save a measurement taken on channel 2 but discard the measurement taken on channel 1.

### Setting up Sensors and Channels



- Select your measurement type and parameters as normal and press **ALT** then **5** **Sensor Setup**.

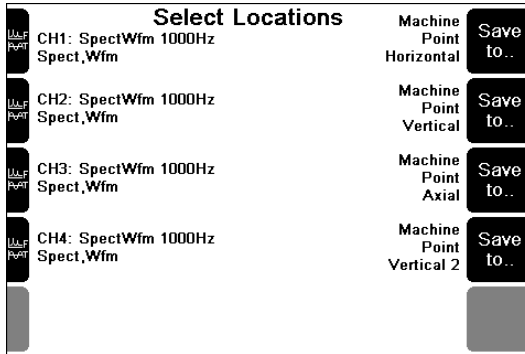
- You will need to assign and enable a sensor to each channel you are measuring. Press **Change Sensor** opposite your chosen measuring channel. (If this is new sensor that has not yet been defined in the instrument you will need to create a sensor definition before you can assign it to a channel. See *Defining and Editing Sensors* on page 107.)
- Use the arrow keys to highlight a sensor then press  to assign it to your channel.
- To enable the channel for measuring, press the left-hand key beside your chosen channel. The text will change from '---' to 'Enabled' to indicate that this channel can now be used to take measurements.

Sensor Setup			
CH1	Enabled	Accel 100mV/g	Change Sensor
CH2	Enabled	Accel 100mV/g	Change Sensor
CH3	Enabled	Accel 100mV/g	Change Sensor
CH4	Enabled	Accel 100mV/g	Change Sensor

- Repeat this process to enable additional channels then press  twice to begin measuring. To save the measurements refer to the next topic.

## Saving Multi-channel Measurements

1. When you are ready to stop measuring press .
2. Press  **Save**. This opens the Select Location to Save Menu.



3. You can save each channel's measurements or select only those that you wish to keep. Press the right-hand **Save to..** key opposite the channel you wish to save.
4. Use the arrow keys to select a location to save the measurement or press **ALT** if you need to create a new location. (See Storing Measurements on page 75 for more information.)
5. Press  to return to the Select Locations Menu. Repeat this process from step 3 to store your other measurement(s). If you change your mind after saving a measurement press the channel's right-hand Save key again - the text will change to '(Don't Save)'.
6. When you have selected all the measurements you want to save press . The instrument will display 'Data Saved' before returning to the measurement screen.

## Section 9: Taking Recordings

This section describes how to take recordings with your instrument.

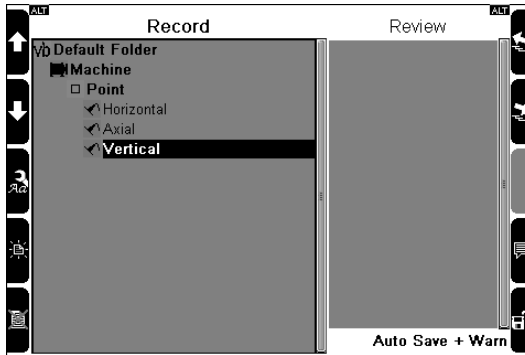
You will learn to:


- Take recordings
- Review and delete recordings
- Attach notes to recordings

### Walk-through: Taking Recordings

The following instructions assume that you have already created your machine structures and have assigned parameter sets to the measurement locations.

1. Connect your sensors to the appropriate measurement locations. If you are taking tachometer readings, set up the tachometer also.
2. Ensure the folder containing the machines you want to monitor is selected; the name of the currently selected folder will display on the Main Menu beside the 'Folders' label. If you need to select a different folder press **4** **Folders** and use the arrow keys to highlight your choice then press **✓**. This loads the folder and all its machines into current memory and returns you to the Main Menu.
3. Press **3** **Review Vibration** to display the machines within this folder. If necessary, select Save by pressing **0** (for a recording this should normally be set to Auto Save + Warn. Refer to Recording Save Options on page 97 for more information).
4. Use the left-hand arrow keys to scroll up and down and press **7** **Expand Navigator** repeatedly to expand out a machine so that its points and locations become visible.





5. To take an individual recording, highlight the parameter set that you wish to record. If you want to record all parameter sets at a location, highlight the location. The recordings will be taken one after the other in the sequence that they appear in the instrument.
6. To start the first recording press . The instrument and sensor will take a short time to settle before recording begins.

When the recordings are finished the instrument stores them to the correct measurement location and returns you to the Record Review Menu. To take additional recordings, select another parameter set (or select a location to record all parameter sets under that location) and repeat this process from step 5.

## Taking Individual and Multiple Recordings

You can choose to record all parameter sets at a location or select the parameter sets individually. This allows you to selectively record data, or speed up data collection by reducing the number of key presses needed to take multiple recordings at a single location.

- To record an individual parameter set, highlight it and press  to begin recording.

- To record every parameter set under a location, highlight the location and press  to begin recording.

## Saving Recordings


When you are in the Record Review Menu you have several options for saving your recordings.

### Auto Save

The instrument momentarily displays the recorded information on-screen before returning you to the Record Review Menu.




### Record/Review

The instrument pauses after each recording so that you can review it on-screen.



- To take the next recording press . This will either return you to the Record Review Menu or, if you have selected a location with multiple parameter sets underneath it, begin taking the next recording.

### Free Run, Manual Save

The instrument will continuously record the signal and update the on-screen display.

- To stop measuring press  To save the recording press .
- To record the next parameter set without saving this recording press . This will either return you to the Record Review Menu or, if you have selected a location with multiple parameter sets underneath it, begin taking the next recording.

## Reviewing Recordings

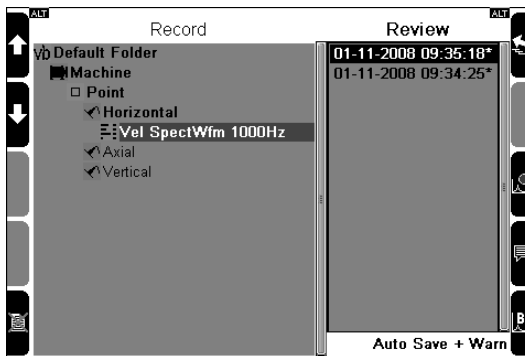
To review recordings immediately after taking them you can set the instrument's save option to Record/Review; to do this, from the Main Menu press  **Review Vibration** then press  repeatedly until

'Record/Review + Warn' displays in the lower right-hand corner of the screen.

### To review stored recordings

1. From the Main Menu press **3** **Review Vibration**.
2. To select a recording for review, use the left-hand arrow keys to scroll up and down and press **7** **Expand Navigator** repeatedly to expand out a machine so that its locations and parameter sets become visible.
3. When you highlight a parameter set its associated recordings will appear in the Review column. The newest recording is highlighted at the top of the column. To display the newest recording press **8** **Review Selected Recording**.
4. To display older recordings press **7** once more to select the Review column; a black border will appear around the column indicating that you can now move up/down through the recordings. Use the left-hand arrow keys to select a recording then press **✓** to display your selection.

**Note:** An asterisk beside a recording indicates that more than one recording type is contained within the record (spectrum and waveform).



*The black border indicates all recordings can be reviewed*

1. When a recording is displayed you can use cursors, harmonics and zooming to better analyze the data. Press **?** to display hint labels and refer to the appropriate topics in Analyzing Measurements (page 66) for details of how to use cursors and zooming.
2. When you have finished reviewing the recording press **X** to return to the Review column from where you may select another recording for review, or press and hold **X** to return to the Main Menu.
3. To select recordings from a different parameter set, location or machine, press **6** to navigate back to the machine list in the Record column. A black border will appear around the Record column indicating that you can now select items.
4. Repeat steps 2-4 to review additional recordings.

## Deleting Recordings

To delete an individual recording, access the Review Vibration Menu and select the recording as described in the previous topic:

- Press **5** to delete the recording and confirm the deletion by pressing **✓**.

## Attaching Notes

To add a text note or comment to a recording:

- Highlight the recording in the Review column then press **9** to open the Note Menu. Refer to the appropriate topics in Working with Notes (page 110) for details of how to create and attach notes to your recordings.

---

## Section 10: Creating, Editing and Deleting Items

This section describes the procedures for creating folders, machines and other items within the instrument.

You will learn to:

- Create and manage machine structures, sensors and notes
- Copy and delete items
- Restore items
- Rename and edit items
- Attach and remove notes

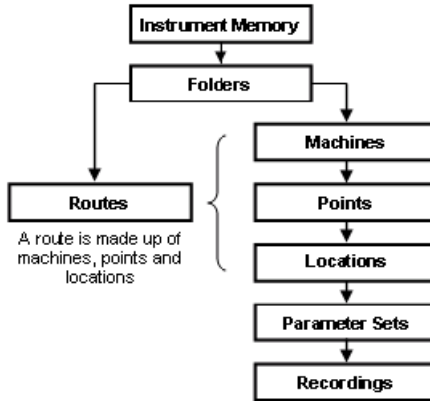
### Storage Capacity and Recording Volume

The instrument's storage capacity is determined by the amount of available memory space, which decreases as more recordings are stored. There is no limit to the number of folders and machines that can be held in the instrument.

The number of recordings that can be stored depends on the type and setup of those recordings e.g. more 400 line spectra can be stored than 800 line spectra because the spectra take up less memory space.

## How are Recordings Organized and Stored?

The instrument uses the following hierarchical data storage structure:



Starting at the bottom of the diagram a **recording** is the data you collect at a particular location on a machine.

A **parameter set** defines a list of measurement parameter values that are used to take a recording. Because parameter sets are stored in the instrument they can be retrieved and reused, which saves time when you are taking large numbers of identical recordings.

A **location** (axis) refers to the direction a sensor is facing when you place it on a machine e.g. horizontal, vertical, tangential etc. Each machine point can have many locations because you can vary the direction (location) of the sensor with each new recording.

A **point** represents a position on a machine that a measurement will be taken e.g. the drive end or driven end.

A **folder** is used to group and identify machines. For example, if you collect vibration data from several factories, you should use a different folder to hold each factory's machines.

Folders, machines, points, and locations are identified by the names you give them. Parameter sets are identified by their parameter

value summaries e.g. accel 400 ms or veloc 1000 Hz. Recordings are identified by their date/time stamps.

## Working with Folders

### Creating a Folder

- From the Main Menu press **4** twice.
- Enter a name for the folder then press **✓**. The newly created folder will be highlighted. Press **✓** again to select and you will be returned to the Main Menu.

When you create new machines they will be placed in whichever folder is currently selected. To change a folder, from the Main Menu press **4** **Folders**, then use the arrow keys to select a folder then press **✓**.

### Renaming a Folder

- From the Main Menu press **4** **Folders**.
- Use the arrow keys to select the folder then press **3** **Edit Name**.
- Edit the name as required then press **✓**.

### Deleting a Folder

- From the Main Menu press **4** **Folders**.
- Use the arrow keys to select the folder then press **5** **Delete Folder**.

### Restoring a Deleted or Over-Written Folder

A folder backup is automatically generated every time a folder is deleted. If you wish to recover recordings that were previously stored in a folder that has been deleted *up to a maximum of five folder deletions ago*, the entire folder can be recovered using this backup.

The folder's restore point will be the date and time of its original deletion.

Note that only the **five most recently deleted folders** are retained within the instrument's recycle folder.

- From the Main Menu press **4** **Folders**.
- Press **7** **Restore Folder**. The Restore Folders screen will open.
- Use the left-hand menu arrows to select a folder to restore. The date beside the folder indicates when it was deleted.
- Press **✓** to restore the selected folder.

**Note:** If you have created a new folder with the same name as the backup folder, the existing folder will be overwritten during the restoration process. To prevent this, rename the current folder.

**Warning:** All folder backups will be erased during an instrument Proflash (page 136).





## Working with Machines

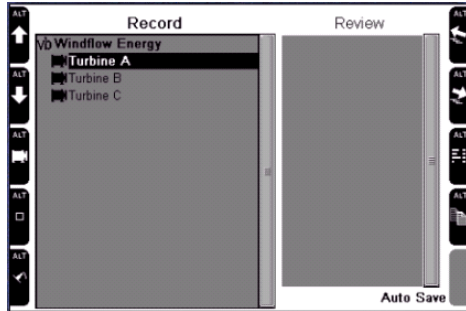
If you intend to take large numbers of recordings on a regular basis you should create permanent machine structures so that you can save your recordings to named locations. You can group your machines within different folders so that they can be segregated by type, geographic location, or frequency of data collection etc.


### Creating Machine Structures

- First select the folder you want to store your machines in. From the Main Menu press **4** **Folders** and use the left-hand arrow keys to highlight a folder, then press **✓**.
- Press **3** **Review Vibration** then press **ALT** to display the machine creation icons.

## Key Icon

<b>3</b>		Machine
<b>4</b>		Point
<b>5</b>		Location
<b>8</b>		Parameter set (Schedule)









- To create a new machine press **3** **Add New Machine**.
- Enter a name for the machine then press .
- To create points, locations and parameter sets, press the keys beside the appropriate on-screen icons and repeat the previous instructions.





## Creating Parameter Sets

A parameter set describes the settings that are used to take a measurement. A parameter set includes information such as the type of measurement, Fmax, the units of measurement and number of averages etc.





- From the Main Menu press **3** **Review Vibration** and use the left arrow keys to select a machine. If no machines are displayed press **7** to make them visible.
- Press **7** repeatedly to expand the machine until the required axis location is selected.
- Press **ALT** to display the machine creation icons then press **8** **Add New Schedule**.
- Select a measurement type. The screen will display the default parameters for your measurement.

- To assign the *default* parameter set to this location press  , or to create a new parameter set press . The new parameter set will appear at the top of the list ready for editing.
- To rename this parameter set press  **Edit Name**. Enter a name for this parameter set then press .
- Edit the other parameters as required. To assign a different sensor press  and refer to the sub-heading below, otherwise press  to return to the Record Review Menu.

### Changing the sensor

- To assign a different sensor press  **Sensor Setup** then press Change Sensor opposite your measuring channel and select a different sensor. (To define a new sensor press  **Create New Sensor**. See Defining and Editing Sensors on page 107 for more information.)
- Press  **Select as Default**.
- If required, press the left-hand key beside your chosen channel so the text changes to 'Enabled' then press  twice to return to the Record Review Menu.

### Adding Structures to Existing Machines

- From the Main Menu press  **Review Vibration**.
- If no machines are displayed press  to make them visible.
- Use the left-hand arrow keys to select a machine and press  repeatedly to expand the machine so that its points and other lower level items are made visible.
- Select the machine, point or location where you want to add the new structure then press  to display the machine creation icons.

- Press the appropriate keys beside each icon to create that item.

## Copying Machine Structures

You can copy an entire machine or just part of its structure, such as a point or parameter set, and add the copied items to other machines.

**Note:** Only the machine structure is copied when a new machine is created in this way - recordings are not copied.

- From the Main Menu press **3** **Review Vibration**.
- If no machines are displayed press **7** to make them visible.
- Use the left-hand arrow keys to select a machine. To make the points and other lower level items visible press **7** repeatedly.
- Highlight the item you wish to copy then press **ALT** then **9** **Copy**.
- Use the on-screen arrows to choose where your copied item will be pasted then press **0** **Paste**.

## Renaming Machine Structures

**Note:** The default locations (horizontal, vertical etc) cannot be renamed. If you want to rename a location from horizontal to vertical, say, simply create a new vertical location on a point and copy any required parameter sets from the horizontal location, then delete the horizontal location.

- From the Main Menu press **3** **Review Vibration**.
- If no machines are displayed press **7** repeatedly to make them visible.

- Use the left-hand arrow keys to select a machine. To make the points and other lower level items visible press **7** repeatedly.
- Select the item you wish to rename then press **3** **Edit Name**.
- Edit the name as required then press **✓**.

## Deleting Machine Structures

**Note:** Any parameter sets used by a deleted machine will **not** be removed but will remain stored in the instrument so they can be applied to future recordings.


- From the Main Menu press **3** **Review Vibration**.
- If no machines are displayed press **7** repeatedly to make them visible.
- Use the arrow keys to select a machine. To make the points and other lower level items visible press **7** repeatedly.
- Select the item you wish to delete then press **5** **Delete**. Press **✓** when prompted to confirm your action.

## Working with Sensors

### Defining and Editing Sensors

- From the Main Menu press **0** **Options**.
- Press **5** **Sensor Setup** then press Change Sensor opposite your chosen measuring channel.
- To create a new sensor press **4** **Create New Sensor** or use the left-hand arrow keys to select an existing sensor then press **3** to change its settings.

Sensor			
Name	Accel 100mV/g	100	Sensitivity
Type	Accel.	mV/g	Unit
Voltage Rng and Coupling	AC +/- 8V		
Settling	3 s	ON	Drive Current
Auto Settling	ON	(none)	Bias Voltage Check

- Define the settings by pressing the corresponding keys. When you are finished press .

- 1** Edit the Name.
- 2** Toggle the Sensor Type between acceleration, velocity, displacement and current.
- 3** Toggle Voltage Ring and Coupling settings.
- 4** Toggle Auto Settling ON/OFF. When Auto Settling is ON the instrument will ignore the user-specified settling time (see above) and will automatically select the most efficient settling time for your sensor type.
- 6** Edit the Sensitivity. The range of sensitivities will vary depending on the selected sensor's Store Unit. To enter a decimal point press **ALT** then **0**.
- 7** Toggle the Store Unit e.g between mV/g and mV/m/s<sup>2</sup> for accelerometers.
- 9** Toggle the sensor's Drive Current ON/OFF. (Drive Current is the 2.2 mA power supply for IEPE/ICP<sup>®</sup>-type accelerometers).
- 0** Toggle Bias Voltage Check on and off (none), and edit, create or delete this value.

### Notes on defining and editing sensors:

- Once a sensor has been defined as a particular sensor *type*, e.g. accelerometer, you will not be able to change the sensor's type if the instrument contains any recordings taken with that sensor; the instrument will associate these recordings with their sensor. If you need to redefine the sensor type, delete all the associated recordings in the instrument first.
- 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 acceleration you cannot select a current sensor. When you try to take the measurement the instrument will display a message similar to the following:

Incompatible Sensor  
Cannot take recording of type: Current  
When using a sensor type Acceleration

## Using the Bias Voltage Check

The Bias Voltage Check allows the instrument to warn operators of errors or fault conditions such as short-circuits, faulty sensors or open-circuits by comparing the actual sensor bias voltage with the expected voltage range, as configured in the instrument.

Most accelerometers have an output voltage centered on 12 V DC, so the instruments have a default bias voltage range of 8 V to 16 V.

Some sensors may utilize a lower or higher bias voltage. If using such a sensor, review the manufacturer's documentation and create a new Bias Voltage range to suit.

To change the sensor's Bias Voltage range settings:

- From the Main Menu press **0** **Options**.
- Press **5** **Sensor Setup**.
- Press the Change Sensor button opposite the channel you will use.

- Press **3** **Edit Sensor** to edit the configuration of an existing sensor, or **4** **Create New Sensor**. Configure the sensor's normal parameters (name, type, settling, units etc.).
- Press **0** **Bias Voltage Check** to open the Bias Voltage screen. Note that each press of **0** toggles the Bias check on/off.
- Press **4** **Create New Bias Voltage**.
- Press **2** and enter a name. You may wish to use the name of the sensor, then press **✓**.
- Press **3** **Min Bias** and enter the minimum bias Voltage level then press **✓**.
- Press **4** **Max Bias** and enter the maximum bias voltage level then press **✓**.
- Press **✓** twice to select the new bias check configuration. The sensor will now use the new or edited bias values.

## Deleting Sensors

- From the Main Menu press **0** **Options**.
- Press **5** **Sensor Setup** then press Change Sensor opposite your chosen measuring channel.
- Use the left-hand arrows keys to highlight your sensor then press **5** **Delete Sensor**.

## Working with Notes

### Creating Notes

You can create and store notes up to 50 characters in length on the instrument. These can be attached to any part of a machine structure

- From the Main Menu press **3** **Review Vibration**.
- Press **9** to display the Note Menu then press **4** **New Note**.
- In the Note Entry Menu press **4** and enter your text. Press **0** to enter punctuation and **9** to enter a space, and **ALT** then **8** to delete characters.
- Press **✓** to save the note.






## Editing Notes

- From the Main Menu press **3** **Review Vibration**.
- Press **9** to display the Note Menu then press **4** **Create New Note**.
- In the Note Entry Menu press **3** **Edit Note** and enter your new text. If the note is attached to any items you will be prompted to create a new note.
- Press **0** to enter punctuation and **9** to enter a space.
- Press **✓** to save the note.

## Attaching Notes

You can attach notes to the machines, points and axes within the machine structure.

- Use the arrow keys to highlight the item you want to attach the note to.
- Press **9** to display the Note Menu then press **4** **Create New Note**.




- Select a note then press  to attach it to your chosen item, or  to create a new note. If you want to attach additional notes press  again and repeat this process.
- Press  to return to the previous menu. The note icon  will appear beside your chosen item to indicate that a note is attached.

## Viewing Notes





- To view a note, use the arrow keys to highlight the item with the note attached then press  **Notes**.


## Removing Notes

Removing a note only detaches it from a selected item. The note will remain in the Note Entry Menu where it can be selected and attached to other items. To permanently delete a note see the next topic.

- Use the arrow keys to highlight the item with the note attached.
- Press  to display the Note Menu and highlight the note you want to remove.
- Press  **Delete Note** then press  to return to the previous menu.




## Deleting a Note Permanently

- From the Main Menu press  **Review Vibration**.
- Press  to display the Note Menu then press .
- In the Note Entry Menu use the arrow keys to select the note then press  **Delete Note**.

- If the note is attached to any items you will be prompted to confirm your action. Press  to confirm.

## Deleting all Recordings in a Folder

To delete an individual recording please refer to topic Deleting Recordings on page 99.




- To delete every recording in a folder, from the Main Menu press  **Folders**.
- Use the arrow keys to select a folder then press  **Delete Recording**. Press  to confirm.

## Deleting all Stored Information

All folders, machines, parameter sets, recordings and notes etc are stored in a single container called a database. To clear out all your machine structures, customized settings and recordings you can empty the instrument database. This restores the instrument to its factory default settings.

Use this procedure **only** if the database becomes corrupt, or if you are certain that you no longer require any of the information stored in the instrument e.g. if you plan to resell the instrument.

**Warning:** Emptying the database removes **all** information stored in the instrument. You will lose all machines, parameter sets and notes. Only the factory default settings such as axis names, parameter sets and notes will remain.

- From the Main Menu press  **Folders** then press  **Empty Database**.
- Press  twice to confirm.

# Section 11: Utilities

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

You will learn to:

- Set the instrument date and time
- Adjust the LCD display
- Change the LCD interface language
- Transfer data to and from a USB flash memory device
- Manage the battery pack
- Release instrument memory
- Upgrade the instrument's firmware
- View the instrument's system information
- Activate the instrument's 'mirror' backup database
- Format (erase) the instrument's flash memory
- Manage the battery pack
- Use the vbXManager software

## Setting the Date and Time

You can set the time in 12 hour or 24 hour format. Recordings are date- and time-stamped according to this clock. The instrument adjusts the date and time automatically to accommodate leap years and daylight savings. You can also select your local time zone automatically (see next topic).

- From the Main Menu press **0** **Options**.
- Press **0** **Date/Time** then press **3** to set the date or **4** to set the time.
- Press the number keys to enter your values; the cursor will automatically advance to the next position. If you enter an incorrect number press the key repeatedly until the cursor returns to the beginning of the line then start again.
- Press **✓** to save your changes.

## Adjusting the Date Format

- From the Main Menu press **0** **Options**.
- Press **0** **Date/Time**.
- Press **8** repeatedly to cycle between date display formats (from DD/MM/YYYY to MM/DD/YYYY, for example) or **9** to toggle between 12 and 24 hour time formats.

## Selecting Your Local Time Zone

- From the Main Menu press **0** **Options**.
- Press **0** **Date/Time** then press **2** **Edit Timezone**.
- Use the arrow keys to highlight your local time zone then press **✓** to select.

**Note:** You can jump to the top and bottom of the list using the right-hand arrow keys **6** and **7**.

## Adjusting Sound Volume

- From the Main Menu press **0** **Options**.
- Press **8** **Sound**.
- Use the right-hand arrow keys to adjust the volume up **7** or down **6**. Press and hold **6** to turn sound off.
- Press **2** to test the volume then **✓** to save your setting.

## Set the Instrument Language

The language used by the instrument interface varies from region to region based upon the original purchase location. Some regions,

such as North and South America, include more than one selectable language option. To change the language used by an instrument:

- From the Main Menu press **0** **Options**.
- Press **7** **Language**.
- Use the left-hand **1** and **2** arrow keys to select a language from the list of those available. The two windows at the bottom of the screen demonstrate how the language selected will appear in use.
- Press **✓** to save your language selection.

## Adjusting Screen Contrast

- From the Main Menu press **0** **Options**.
- Press **6** **LCD Contrast Backlight**. The screen displays a chart and text so that you can preview the effect your adjustments will make on the display.
- Use the **6** and **7** keys to increase or decrease the screen contrast then press **✓**.

## Turning the Backlight On/Off

The backlight consumes a relatively high level of power and will automatically turn off after a timeout period (see Setting Backlight Timeout (page 118)).

- From the Main Menu press **0** **Options**.
- Press **6** **LCD Contrast Backlight**.
- Use the **1** and **2** keys to adjust the backlight brightness or turn it off then press **✓**.

If the backlight level is set to 'High', the LCD backlight level will be reduced automatically to the 'Low' setting ten seconds before it times out (as configured in Setting Backlight Timeout (page 118)). This advance notice will allow you to press any key (**ALT**, for example) to return the backlight to its previous level.

## Recharging the Instrument

- Plug the power transformer into a standard power outlet and attach the connector to the instrument's charger socket. You can continue to use the instrument while the battery is charging.

## Estimating Remaining Operating Time

The instrument can estimate its remaining operating time based on the amount of current remaining in the battery and the average current usage. The true operating time before the battery runs flat will depend on how you use the instrument. You can check the estimated operating time in the Battery and Power Management Menu.

- From the Main Menu press **0** **Options**.
- Press **9** **Battery Pwr Mngmnt**. The estimated operating Time Left is displayed near the middle of this screen.

**Note:** The battery 'State' percentage value and 'Time Left' figure on the 'Battery and Power Management' screen will not attain maximum accuracy until the battery has completed at least one 'learn cycle'. This consists of using the instrument until the battery discharges to a near empty state (below 7 V, when a battery warning icon appears in the middle of the LCD screen), then performing a complete charge cycle (a full three hour charge without interruption). Until this sequence is completed the 0% and 100% indications may be inaccurate by +/-10%.

## Conserving Battery Power

The length of time you can operate the instrument will depend on how it is used and what settings you apply. You can adjust the following settings to reduce your power consumption and increase the instrument's operating time.

- Sound volume
- Screen brightness/contrast
- Backlight brightness and timeout period
- Sleep Mode timeout
- Shutdown timeout

### Setting Backlight Timeout


The backlight will turn off automatically after the timeout period has elapsed (60 seconds by default). If a measuring period exceeds the backlight timeout, the backlight will remain on during measuring and will turn off when measuring is complete.

- From the Main Menu press **0** **Options**.
- Press **9** **Battery Pwr Mngmnt**.
- Press **3** **Turn Off Backlight**. Enter a value in seconds (minimum 1, maximum 9999) then press **✓**.


### Setting Sleep Mode Timeout


Sleep mode turns the instrument off if no keys are pressed for a set period of time (15 minutes by default). This method of auto-powering off the instrument conserves battery charge and allows for fast powering up (approximately 7 seconds). However, it is less battery efficient than using the Complete Powerdown option because the internal module remains on. The instrument will power down completely once the complete powerdown timeout period has elapsed (see next topic).

- From the Main Menu press **0** **Options**.
- Press **9** **Battery Pwr Mngmnt**.

- Press **4** **Enter Sleep Mode** and enter a value in minutes (minimum 1, maximum 9999) then press .


### Powering up the instrument

- To power up the instrument from sleep mode press  Power as normal.

**Note:** If the battery level drops to 25% or less, sleep mode is disabled. The instrument will immediately enter Complete Powerdown Mode when  Power is pressed, or at the completion of the Sleep Mode Timeout period.

### Setting Complete Powerdown Timeout

Complete powerdown turns the instrument off after a set period of time (1 hour by default) in Sleep Mode.

- From the Main Menu press **0** **Options**.
- Press **9** **Battery Pwr Mngmnt**.
- Press **5** **Complete Powerdown** and enter a value in hours (minimum 1, maximum 9999) then press .

## Managing Instrument Memory

The instrument's internal memory requires occasional maintenance to ensure the device operates efficiently. The following topics detail how to check available instrument memory, what types of memory warnings you may encounter over times, and the procedures for freeing instrument memory and formatting the instrument's internal memory card.

### Checking How Much Memory is Available

The Memory Menu displays information on the instrument's memory capacity, the amount of memory in use, and the number of folders, schedule entries and recordings stored in the instrument.

- From the Main Menu press **0** **Options**. The percentage of instrument memory currently being utilized will be displayed beside **4** **Memory & System**.
- Press **4** **Memory & System** to display the instrument's actual memory usage. Press **✓** to return to the Options Menu.

## Instrument Memory Warnings

Approximately one third of the instrument's 1 GB of internal memory is occupied by system data. All remaining data capacity is available for recordings, notes etc. This free memory is capable of accommodating significant amounts of measurement data.

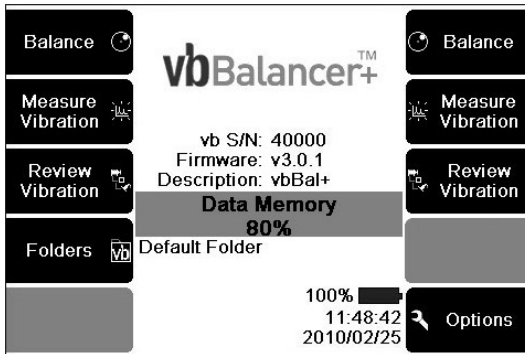
It is, however, possible for the device's memory to become full if large numbers of high resolution recordings are taken over a long period of time, or if older recordings and balance jobs are allowed to accumulate unnecessarily in the device. Large amounts of data will slow the instrument and increase balance times, and should be deleted or transferred removed whenever possible.

In the event that 80% or more of the device's memory capacity is utilized, a series of alert messages will be displayed on the instrument.

### 80% Memory Capacity Warning

If memory use is allowed to exceed **80%** of the instrument's total memory capacity, a flashing warning will be displayed on the Main Menu.

This message will remain until the device's memory use has been reduced to below 80%. This can be accomplished by deleting recordings or folders from the instrument, or by emptying the instrument recycle bin.



A single pop-up message will also be displayed, warning of high memory use. This message will appear shortly after the 80% threshold is crossed, regardless of the screen currently being viewed, and will require acknowledgement.



### 95% Memory Capacity Warning

If memory use is allowed to exceed **95%** of the instrument's capacity, a second pop-up alert message will be displayed warning of high memory use.

## 100% Memory Capacity Warning

If the instrument's memory use is allowed to reach **100%** of its maximum capacity, a pop-up message will be displayed advising that no more recordings can be saved.

## Freeing Instrument Memory

Unnecessary data should be removed from the instrument whenever possible; preferably by copying your instrument database or balance jobs to a vbXManager host PC then deleting these measurements from the instrument memory. The easiest way to do this is to format the instrument's memory (see the 'Reformat Memory Card' topic on page 122) or empty the instrument's recycle bin (see the 'Empty Recycle Bin' topic on page 123).

**Note:** To manually delete individual folders from the instrument, press **4** **Folders** from the main menu, select a folder from the list then press **5** **Delete Folder**. Avoid deleting folders containing measurements that have not been transferred to the vbXManager software unless you are certain they are not required.

## Reformat Memory Card

Like conventional hard drives, data stored on flash memory devices can become fragmented over time, gradually slowing data write/read speed. Reformatting this memory will return it to its factory state, and detect and quarantine any bad data sectors that may have developed after the memory device's manufacture. Data corruption that cannot be removed by deleting individual files will also be corrected by the formatting process.

The instrument will suggest that you to format its memory once 365 days or more have passed since the last flash memory format occurred, or every 50 000 recordings. Once formatted, these counters will be reset.

Formatting the instrument memory will delete all machines, parameter sets, notes and recordings, returning the device's memory to its original blank factory configuration. The formatting process will complete in approximately ten minutes once started.

**Note:** if you wish to retain data stored on the instrument, retrieve this information (copy the database) from the device using the vbXManager software before formatting. **The formatting process will delete all data in the instrument.**

- From the Main Menu press **0** **Options**.
- Press **4** **Memory & System** to open the 'Memory' screen. The instrument's memory usage will be displayed.
- Press **3** **Reformat Memory Card** then **✓** to confirm that you wish to format the instrument memory. The format process will begin, during which the instrument will display a series of progress messages. Do **not** interrupt the formatting process; doing so may damage the instrument. Upon completion, press and hold **5** then press **⏻** to re-start the instrument.

## Empty Recycle Bin

A folder backup is automatically generated every time a folder is deleted. This backup is stored in the instrument recycle bin. To free additional memory capacity on the instrument you may wish to empty the recycle bin, removing these backup files. All folders contained within the recycle bin will also be erased during an instrument Proflash (page 136).

- From the Main Menu press **4** **Folders**.
- Press **8**. You will be asked to confirm that you wish to empty the recycle bin.
- Press **✓** to empty the recycle bin or **X** to cancel.

## Overwrite Primary Database with Mirror Backup

The vbBalancer instrument includes two operational databases: a primary database used to store system information, measurements and setup data, and a secondary 'mirror' backup database. The mirror database is an exact duplicate of the current system

database, continually updated in real time. If database corruption is detected (from a memory failure, for example), the instrument will automatically prompt you during startup to overwrite the primary database with the mirror database.

To overwrite the current system database with the mirror backup database:

- From the Main Menu press **0** **Options**.
- Press **4** **Memory & System** to open the 'Memory' screen.
- Press **2** **Swap to Mirror DB**. Press **✓** to overwrite the primary database with the mirror backup, or **X** to cancel. Once the mirror database has been overwritten, you should immediately import all data from the instrument into the vbXManager software (see Backing Up the Instrument Database (page 137)), then perform a memory card format before taking any further measurements.

## Display System Information

If you encounter a problem with your instrument and require assistance from Commtest customer support, you may be asked to provide specific information about your vbBalancer instrument system. To access these details, follow the steps detailed below:

- From the Main Menu press **0** **Options**.
- Press **4** **Memory & System** to open the 'Memory' screen. The instrument's system details will be displayed at the bottom of the screen below the **System** heading.

**Firmware Version.** The instrument's current firmware version. New firmware versions are released regularly and can be downloaded from the Commtest website at <http://www.commtest.com>. Instructions for installing new firmware versions are detailed in the following section, Upgrading Instrument Firmware (Proflashing) (page 136).

**Firmware Backup.** The firmware version that will be used if you elect to restore the backup firmware version by pressing **4** **Restore Backup Firmware.** Restoring the instrument firmware will reset the instrument to its factory state, and should only be used if a conflict arises with a new firmware version, or in the event that the installed instrument firmware becomes corrupted.

**PCB Revision.** This is the instrument PCB board version. Possible revisions are C, D and E. Revision E versions include USB host ports and C1D2 CSA certification. Revision C and D boards are found in earlier instrument versions.

**OS version.** The instrument's operating system.

**Instrument Region.** The region the instrument has been configured to, and therefore the languages supported and available. These include 'English' (English), 'Americas' (English, French and Spanish), 'Europe' (French, Spanish, Hungarian), 'Russia' (Russian) and 'China' (Chinese)'.

**Processor Type.** The (CPU) processor type used in the instrument.

The bottom right-hand corner of the screen displays your instrument's unique 20-digit serial number. This serial number may be requested by Commtest technical support in order to create customized upgrade packages tailored to your specific vbBalancer device.

## Using the vbXManager Software

vbXManager software is used to retrieve balance reports from vbBalancer and vbBalancer+ instruments. Once imported, these reports can then be printed directly from the software or exported to an external spreadsheet application.

The vbXManager software allows users to specify the units displayed in each report (S.I, U.S./Imperial or Custom Units) and to customize their appearance with the optional inclusion of a company logo. Basic administrative functions such as the updating of instrument firmware and backing up of instrument databases are also included in the vbXManager utility.

## vbXManager Software System Requirements

Minimum system requirements for the vbXManager software are:

- Microsoft® Windows® XP® SP2, Server 2003®, Server 2008®, Vista® or 7® (32 or 64-bit) operating system
- 1 GHz 32-bit (x86) or 64-bit (x64) processor or faster
- 1 GB of system RAM
- 1 GB of available hard disk space
- A CD-ROM compatible optical drive
- Windows-compatible mouse, touchpad or other pointing device
- An unused USB or Ethernet port for instrument communications
- Microsoft .NET Framework® Version 3.5 SP1 or higher

Note that you must have Administrator rights to install vbXManager software. If you are within a corporate or managed network you may need to contact your network administrator to request a group user policy that allows Windows registry changes.

**Note:** The vbXManager and Ascent software applications should not be operated simultaneously. Close the Ascent software, if running, before starting the vbXManager software.

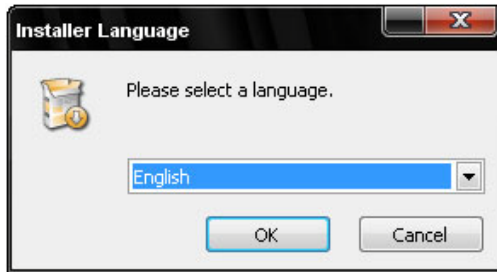
### Installing vbXManager Software

- Close all open programs on your PC.
- Insert the Ascent and vbXManager installation CD-ROM into your computer's CD-ROM drive.
  - Wait for the installation home screen to open in your web browser and follow the onscreen instructions.

OR

- Run the **vbXManagerSetup\_[VERSION].exe** installer program located in the root directory of the CD-ROM.

- Select the installation language from the dropdown list then click **OK**.



- Click **Next**.
- Accept the license agreement by scrolling to the bottom of the text, selecting the two checkboxes, then clicking **Next**.
- Accept the default installation location and press **Install**. The software will install.
- Click **Close**.

## Uninstalling vbXManager Software

- Navigate to **Start>All Programs>Commtest>vbXManager>Uninstall vbXManager** and follow the on-screen instructions, or;
- Navigate to **Start>Control Panel>Add or Remove Programs**. Select 'Commtest vbXManager' and click the **Remove** button.

## Changing the Interface Language

The vbXManager software interface is provided in several languages. The steps required to change the displayed interface language are described below.

## Change the Software Interface Language

- In the vbXManager software, select **Balance>View reports**. The 'vbX Balance Reports' screen will open.

- Click the **Select Language** () button. The 'Select Language' panel will open.



*Select Language*

- Select the language you require from the list of available languages then click **OK**. The software interface will update and a notification will be displayed stating that the language has changed.

**Note:** To view the vbXManager software in a non-Roman character set language, such as Russian or Chinese, you may also need to change your Windows locale setting.

## Change your Windows Locale Setting

See your Windows operating system documentation for further details or use the quick guide instructions below.

### Windows XP Quick Guide

- Select **Start>Control Panel**.
- Double-click the **Regional and Language Options** icon.

- Select your location from the **Locations** dropdown list at the bottom of the **Regional Options** tab.
- Click the **Advanced** tab and select your required language from the **Language for non-Unicode programs** dropdown list.
- Click **OK**. You will be asked to restart the computer.

### Windows Vista Quick Guide

- Select **Start>Control Panel**.
- Double-click the **Regional and Language Options** icon.
- Click the **Location** tab and select your location from the dropdown list.
- Click the **Keyboards and Languages** tab and select your required language from the **Choose a Display Language** dropdown list.
- Click the **Administrative** tab, then the **Change System Locale** button. Select your geographic location. Apply the change then click the **Restart now** button.

### Windows 7 Quick Guide

- Select **Start>Control Panel**.
- Click the **Clock, Language and Region** link.
- Click the **Change Display Language** link. The 'Region and Language' window will open.
- Click the **Administrative** tab, then the **Change System Locale...** button. Select your required language from the 'Current system locale:' dropdown list and click **OK**. You may be asked to restart your computer: do so by clicking the **Restart now** button.

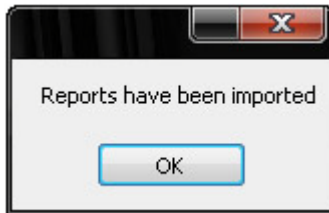
## Retrieve Balance Reports via vbXManager Software

### Retrieve Balance Report from the Instrument

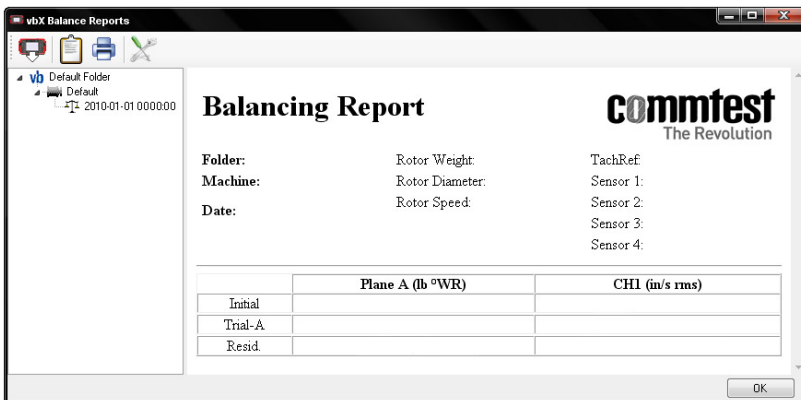
- Connect the vbBalancer instrument to the PC using the supplied USB cable, or connect using an Ethernet cable (a crossover cable for direct connection or via a router/switch for standard Ethernet).
- Turn on the vbBalancer the instrument.
- Start the vbXManager application.
- Select your instrument (identifiable by its serial number) from the vbXManager selection list.
- Press the **Receive Balance Report** button. 'The Receive Report' window will open.
- Select the checkbox(es) beside the balance report(s) you wish to import; or to import all balance reports on the instrument click **Select All**.





- Press the **Receive** button. The balance report(s) will be downloaded and a pop-up notification message displayed.



- Click **OK**. The 'vbX Balance Reports' panel will open. Select individual balance reports from the left-hand menu to display in the right-hand panel.




**Note:** All previously downloaded balance reports will be displayed in the vbX Balance Reports navigator. Downloaded reports are stored in the 'Reports' folder on your computer (typically in C:\Program Files\Commfest\vbXManager\Report in Windows XP) in XML format. These files will remain even after the instrument memory has been cleared or a firmware upgrade has been performed. Over time the Reports folder may gradually increase in size, slowing the performance of the vbXManager software. To restore the software's performance, either delete or back up older files elsewhere on your computer, or archive the files to CD/DVD-ROM or another folder.

- Click the **Print** () button to print the balance report to a connected printer using the vbXManager software. To export the selected balance report press the Clipboard () button. The balance report will be saved to your PC's clipboard memory ready to be pasted into other software applications.

## Specify Balance Report Units

Balance report unit preferences (U.S./Imperial, S.I. or Custom) are configured via the Report Options panel in the vbXManager software.

- Click the **Report Options** () button from the 'vbX Balance Reports' screen. The 'Report Options' panel will open.



**Report Options**

**Unit Preferences**

Unit Set: U.S Units (g, in/s, mil, lb)

Post Scaling: RMS

Weight Orientation: Against Rotation (AR)

**Company Logo**

.\CompanyLogo.gif

**commtest**  
The Revolution

Show Balance Reports on Start Up

- Select your unit preferences from the upper 'Unit Preferences' area to suit your preferred report formatting. Available options for each is as follows:
  - **Unit Set:** U.S. Units (g, in/s, mil, lb, CPM); S.I. Units (m/s/s, ms, m, kg, RPM) or Custom Units (see below).
  - **Post Scaling:** RMS, 0-pk, pk-pk
  - **Weight Orientation:** With Rotation (WR), Against Rotation (AR)
- Click **OK**.

### Specify Custom Units

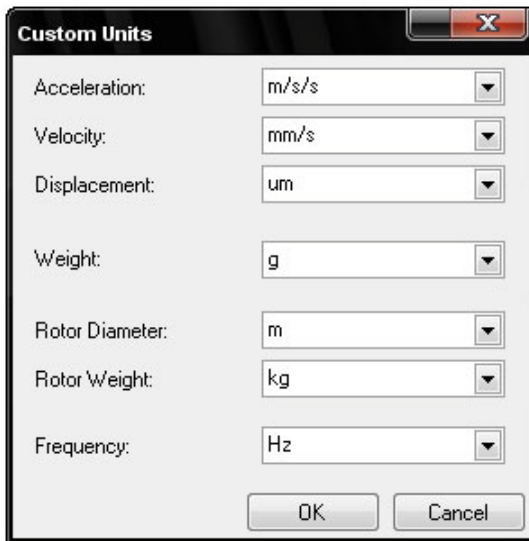
To select a custom unit for one or more of your balance report's parameters:

- Select Custom Units from the Unit Set:' dropdown list. The **Custom Units** button will activate.



Custom Units

- Click the **Custom Units** button. The 'Custom Units' panel will open.

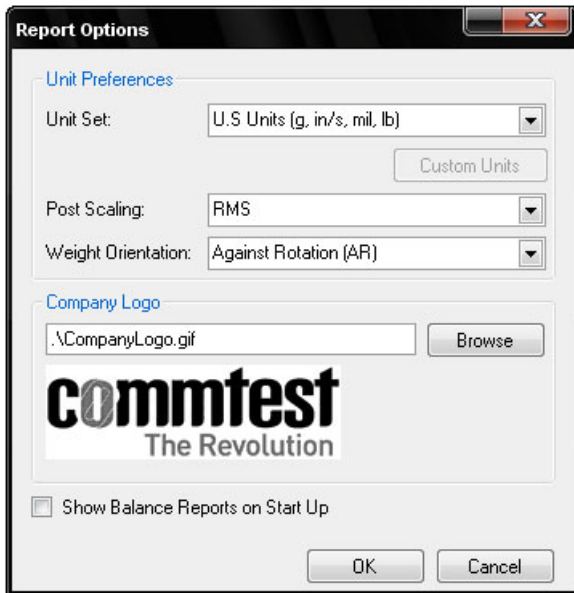


- Select the units you require for each parameter from the dropdown lists.
- Click **OK**, then **OK** again. Balance reports retrieved by the vbXManager software will now use the units specified when displayed, printed or exported.

## Adding a Company Logo to Your Balance Report

The company logo displayed in the top right-hand corner of printed balance reports can be changed using the Report Options panel in the vbXManager software.

- Click the **Report Options** (  ) button from the 'vbX Balance Reports' screen. The 'Report Options' panel will open.



- Click the **Browse** button and navigate to the logo image you wish to display in the top right-hand corner of printed balance reports.

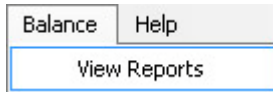
**Note:** the image file must be in JPEG, BMP, GIF or PNG format. You may need to adjust the size of the image in an external image editing application if it is too large for the printed report.

- Click **Save**.

- Click **OK**. The image will now be used when printing balance reports.

## Viewing Existing Balance Reports in vbXManager

Existing balance reports can be viewed by selecting **Balance>View Reports** from the vbXManager's default opening interface.



Existing reports can also be configured to display on startup by selecting the 'Show Balance Reports on Start Up' checkbox from the 'Report Options' panel, as described in the previous topics.

## Upgrading Instrument Firmware (Proflashing)

From time to time Commtest Instruments will release new versions of instrument firmware. These firmware upgrades allow you to take advantage of product enhancements and new features that were created after your instrument was purchased. To re-program an instrument with newer firmware you must PROFLASH the instrument with a new firmware file.


**Note:** Your instrument's current firmware version is displayed on the Main Menu screen.

### Warning:



PROFLASHING will restore the instrument to the factory default state and delete all stored information. This includes folders, machines, parameter sets, balance jobs and recordings. If you wish to save any of this information, please transfer the instrument database to your PC before PROFLASHING. See Backing Up the Instrument Database (page 137) for details.

- To check if a newer firmware version is available, visit our website at [www.commtest.com](http://www.commtest.com) and check the 'Downloads' page. You will need to register your instrument before you can download the latest software.

## Proflash Procedure

- Connect the vbBalancer instrument to the PC using the supplied USB cable, or any Ethernet cable (either directly via a crossover cable or through a switch/router if not).
- Turn on the vbBalancer instrument.
- Start the vbXManager application.
- Double-click your instrument (identifiable by its serial number) in the new window, or select and press **Configure**. The instrument properties window will open.
- Click the **Proflash** button under the **Setup** tab. The **Proflash** window will appear, listing the available firmware version(s) stored on your PC.
- With the newest 'Recommended' firmware version highlighted, click the **Proflash** button. When prompted press  on the instrument. PROFLASHING may take several minutes during which the instrument will display a series of progress messages.

**Note:** Do **not** interrupt the PROFLASH process as this may damage the instrument.

- Once Proflashing has completed, restart the instrument by pressing and holding  then .

## Backing Up the Instrument Database

If you wish to transfer existing balance jobs or recordings to a PC for backup purposes, you can make a local copy of the instrument database using the vbXManager application. This instrument database can then be stored and returned to the instrument at a later time for review.

### Copy Database from the Instrument

- Connect the instrument to the PC using the supplied USB cable or an Ethernet cable.

- Start the vbXManager application.
- Double-click your instrument (identifiable by its serial number) in the new window. The instrument properties window will open.
- Click the **Tasks** tab then the **Copy** button in the Copy Database area. Browse to the location you wish to copy the database to. Enter a name for the file in the **File name:** field and click the **Save** button. A copy of the instrument database will be saved to the chosen location with a '.pbd' file extension.

### Copy Database to the Instrument

**Note:** The existing instrument database will be overwritten during this upload procedure. If you have balance jobs, machines or recordings you wish to save, copy the existing database to your PC first.

- Connect the instrument to the PC using the supplied USB cable, or any Ethernet cable.
- Start the vbXManager application.
- Double-click your instrument (identifiable by its serial number) in the new window. The instrument properties window will open.
- Click the **Tasks** tab then the **Overwrite** button in the Overwrite Database area. Browse to the database file you wish to upload to the instrument and click the **Open** button.

## Export/Import Data via an External USB Flash Drive

**Note:** This feature is intended primarily for owners of vbSeries vibration analyzers and Commtest Ascent software. If you have purchased a vbBalancer instrument and do not have a copy of Ascent software, the information presented below should be ignored.

**Note:** vbBalancer Instruments with serial numbers below 40800 are not equipped with USB host ports.

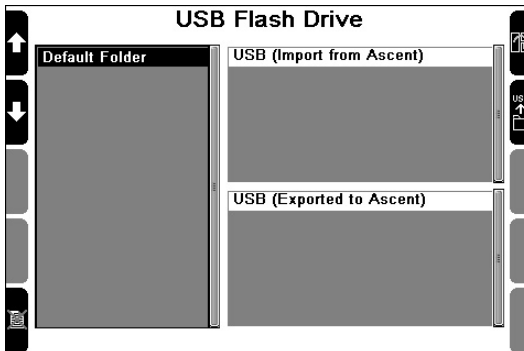
The USB host port is used to transfer data -- recordings, balance jobs, sensor configurations etc. -- from the instrument to an attached USB memory device such as a flash drive or an externally powered USB hard drive, and vice versa. Importable XML data is generated using a compatible software application, such as Commtest's Ascent software.

### Export data to an external USB flash drive:

**Note:** Before proceeding, securely connect a USB flash drive to the instrument's USB host port. Ensure that the USB drive being used has sufficient available storage capacity (i.e. it is not full) and that any 'write protect' tabs, if present, are set to the unlocked position.

- From the Main Menu press **4 Folders**. The 'USB Flash Drive' screen will open.

**Note:** if you have not yet attached a USB flash drive, press **6 USB Flash Drive** to open the USB Flash Drive screen once you have done so.



- Press **6 Select Window** to toggle between the Instrument Folders screen, the USB drive's 'Exported to Ascent' folder ('vbX to Ascent' folder on the USB drive) and the USB drive's 'Import from Ascent' folder ('Ascent to vbX' folder on the USB drive). Select the left-hand Instrument Folders list.

- Use the left-hand **1** and **2** arrow keys to select a folder to be exported.
- Press **7** **Export Folder** to export the selected folder. Press **✓** to confirm the transfer. A progress bar will be displayed and the data exported in XML format to the 'vbX to Ascent' folder at the root of the USB flash drive. If the drive is blank, the folder will be generated automatically. The XML format file can now be imported into the Ascent software. See in the Ascent Reference Guide 'Import/Export as XML' section for more information.

#### Import data from an external USB flash drive:

- From the Main Menu press **4** **Folders**.
- From the Folder Management screen press **6** **USB Flash Drive**. The USB Flash Drive screen will open.
- Press **6** **Select Window** to toggle between the Instrument Folders screen, the USB drive's 'Exported to Ascent' folder and the USB drive's 'Import from Ascent' folder. Select the upper right-hand 'USB (Import from Ascent)' list.
- Use the left-hand **1** and **2** arrow keys to select an XML file to import. The instrument will list the contents of the 'Ascent to vbX' folder on the USB drive, and the root of the USB drive. Only XML format files will be listed.
- Press **7** **Import Folder** to import the selected file. Once imported, return to the Main Menu. The instrument automatically opens the imported folder, which will be listed beside the **Folders** menu option.

# Section 12: 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 at [www.commtest.com](http://www.commtest.com).

## Resetting an Unresponsive Instrument

**Warning:** An unresponsive instrument (one that does not respond to key presses) will continue drawing power until it is reset or turned off. To conserve power you must therefore reset the instrument as soon as possible.


**Note:** Resetting the instrument will not delete previously stored data or settings.

- Hold **5** then press . The instrument will power off and re-start immediately.

## Changing USB Communications Mode

vbBalancer instruments support two USB communication modes: 'Ethernet over USB' and 'Plug and Play' (PnP). The instrument's default and recommended USB connection mode is Plug and Play as it allows vbBalancer instruments to be used as peripheral rather than networked devices, improving stability and compatibility between the vbXManager software and the instrument.

However, legacy Microsoft Windows operating system users cannot use the Plug and Play communications mode. The software driver used for this mode is not supported by the operating system. Owners of computers running Windows versions prior to Windows XP wishing to use USB communications rather than cabled Ethernet (RJ45) must change the instrument to Ethernet over USB mode. To change the instrument's USB communications mode:

- From the instrument's Main Menu press **0** **Options** then **3** **Comms**.
- Press **2** **USB**. You will now be prompted to select from the two available USB communications methods:
  - To use 'Ethernet over USB' communications (suitable for Windows 2000 users) press **ALT** then **✓** to continue. Use the number keys to enter your new USB IP address, netmask and gateway. We suggest accepting the default values as the vbXManager software is configured to use these automatically. Press **✓** after you enter each item.
  - To use 'Plug and Play' communications, press **✓**.
- Press **5** +  when prompted. This will reset the instrument hardware and apply your changes.

## Troubleshooting Network Communications

**Note:** Before changing your network configuration, ensure a firewall is not responsible for your communication difficulty by temporarily disabling any active firewalls (Windows Firewall, for example) and checking that the Commtest application 'vbXmanager.exe' has been given permission to access your network (i.e. it has an 'exception' rule applied to it, if using a firewall).


When communicating using either cabled Ethernet (RJ45) or 'Ethernet over USB' (USB), the instrument and the vbXManager program use a default network address to communicate. Normally it will not need to be changed. However, it is possible that this address may interact negatively with other devices on a network. This conflict may result in other network connections being lost while the instrument is connected to your computer. To resolve this conflict, change the Ethernet network settings in the instrument and vbXManager program.

**Notes:**

Your changes will only take effect once the instrument hardware has been reset.

If you change the network address you must change it in both the instrument and software so that they can communicate (this does not apply if you are only changing the last digit of the IP address).

**Setting the USB Network Address**

- From the instrument's Main Menu press **0** **Options** then **3** **Comms**.
- Press **2** **USB** then **ALT** to select the Ethernet over USB option. Press **✓** to confirm. Use the number keys to enter your new USB IP address, netmask and gateway. We suggest accepting the default values as the vbXManager software is configured to use these automatically. Press **✓** after you enter each item.
- Press **5** +  when prompted. This will reset the instrument hardware and apply your changes.
- Connect the Commtest supplied data transfer cable to the USB ports of the instrument and computer. Start the computer if it is not running already and open vbXManager.
- Double-click the instrument from the list of those available.

**Note:** If you accepted the instrument's default network values then the final step below is not be necessary.

- Enter the new IP address into the **IP address:** field in the **USB** area. Click **Apply** to save the change.

**Setting the Ethernet Network Address**

- From the instrument's Main Menu press **0** **Options** then **3** **Comms**.

- Press **3** **Ethernet**. A message will appear asking if you wish to use a DHCP server to assign an IP address to the instrument.
  - Press **✓** to use DHCP then press **5** + **⏻** to reset and apply your changes, or;
  - Press **X** and enter your new network IP values manually. Press **5** + **⏻** to reset the instrument hardware and apply your changes.

**Note:** Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically configures TCP/IP networked devices.

### Reset Network Values to Factory Default

- From the instrument's Main Menu press **0** **Options** then **3** **Comms**.
- Press **8** **Factory Default** then reset the instrument by holding **5** and pressing **⏻**. The factory default values are Ethernet IP: DHCP (Auto).

# Appendix: Specifications

## vbBalancer

Specifications	Model vbBalancer	Remarks
<b>Sensors</b> Sensor input Sensors AC coupled range Connectors Analog to digital conversion Sensor excitation current Sensor detection	2 channels Accelerometer 16 V peak-peak 2 x BNC (CH1/CH2) 24-bit ADC 0 mA or 2.2 mA (configurable), 24 V maximum Warns if short circuit or not connected	Simultaneous sampling Allows for $\pm 8$ V sensor output swing ( $\pm 80$ g) Safety feature: Break-free inline connector 2.2 mA required for IEPE/ICP®-type accelerometer
<b>Tachometer</b> Sensor Laser sensor range Other Sensor types supported Power supply to sensor TTL Pulse rating Speed range	Laser sensor with reflective tape included in kit 10 cm to 2 m nominal Contact, TTL pulse 5 V, 50 mA 3.5 V (4 mA) min, 28 V (5 mA) max, off-state 0.8 V 10 RPM to 300 000 RPM (0.2 Hz to 5 kHz)	Sensor triggers on beam reflection Dependent on size of reflective tape vb has optically isolated input Battery voltage with current limit
<b>Parameter Indication</b> Maximum levels Dynamic signal range Harmonic distortion Units Magnitude & Cursors Accuracy Frequency response	> 1000 g (10 000 m/s <sup>2</sup> ), > 1000 in/sec (25 000 mm/s), > 100 in (2500 mm), > 10 000 Amps > 95 dB (typical at 400 line resolution) Less than -70 dB typical g or m/s <sup>2</sup> , in/s or mm/s, mil or mm or $\mu$ m Overall RMS value, dual cursors, harmonics $\pm 1\%$ (0.1 dB) $\pm 0.1$ dB from 10 Hz to 15 kHz; $\pm 3$ dB from 1 Hz to 40 kHz	Effective limit is sensor sensitivity and output voltage Other distortions and noise are lower 0-peak, peak-peak or RMS. Auto-scale by 1000x when required Digital readouts on chart AC measured at 100 Hz Acceleration and velocity. From value measured at 100 Hz
<b>Spectrum Display</b> Fmax possible ranges Fmin possible range Resolution Frequency scale Amplitude scale Window shapes Overlap Number of averages Averaging types	25, 50, 100, 125, 150, 200, 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000 Hz 0 to Fmax 800 lines Hz, CPM, Orders Acceleration, Velocity, Displacement Hanning 50% 4 Linear	Or equivalent CPM values Or orders-based from 1X to 999X vb instrument zeroes all spectral lines below Fmin Linear scale with zooming Linear or log scales, auto or manual scaling
<b>Waveform Display</b> Number of samples Time scale	2048 160 ms to 32 seconds	Or orders based from 1 to 999 revs
<b>Logging Features</b> Output formats Data storage Data storage structure Max Folder size Direct print reports USB Host	vb screen 1 GB non-volatile flash memory Folders / machines / points / locations 10 000 measurement locations Via Ethernet to PCL-enabled printer 2.0 to external USB memory device	Virtually unlimited recording storage! No limits are applied, 50 character names
<b>Balancing</b> Planes Speed range Measurement type Weight modes Remove trial weights Manual data entry Storage Channel selection	2 planes, 2 sensors 30 RPM to 60 000 RPM Acceleration, velocity, displacement Angle 0° to 360°, fixed position, circumference arc Yes/No Yes Against machines in data structure Single or dual channel	e.g. weights on fan blades, linear dist. around circumference Automatic recalculation Allows re-entry of previous balance jobs No limits are applied

Specifications	Model vbBalancer	Remarks
<b>Display &amp; Communications</b> Display Resolution Viewing area Backlight Communications with PC USB host	Graphic Grayscale LCD 480 x 320 pixels (HVGA) 4.6" x 3.1" (117 x 79) mm White LED, 4V, 100 Cd/m2 USB and Ethernet 2.0 to external memory device	PROFFLASH allows vb software to be upgraded Save folders to USB flash drive
<b>Battery &amp; Charger</b> Battery Type Operating time Charger type Charge rate	Custom Lithium Ion pack, 7.4 V, 4500 mAh 10 hours Internal charging, automatic control 3 A nominal	Backlight on (60 second timeout) External Power pack 12 V DC, 3 A output, included in kit 3 hours for complete charge
<b>Mechanical</b> Size Weight	9.9" W x 5.8" L x 2.4" H (252 x 148x 60) mm 2.7 lb (1.2 kg)	Including battery and strap
<b>Environment</b> Operating Temp Storage Temp & Humidity EMC Ruggedness Hazardous Locations Certification	14 °F to 122 °F (-10 to 50) °C -4 °F to 140 °F (-20 to 60) °C, 95% RH EN61326 4' (1.2 m) drop onto concrete, IP65 CSA Class I, Division 2 (Groups A, B, C, D) CE, C-Tick	Procedure: 26 drops following MIL-STD-810F-516.5-IV

Revised 3 November 2010. While every effort has been made to provide the most accurate information we advise that information in this document may contain technical inaccuracies or typographical errors. Commtest Instruments Ltd may at any time and without notice make improvements and/or changes to the products described.

## vbBalancer+

Specifications	Model vbBalancer+	Remarks
<b>Sensors</b> Sensor input Sensors AC coupled ranges DC coupled ranges Connectors Analog to digital conversion Sensor excitation current Sensor detection	4 channels Accelerometer, Velocity, Displacement 16 V peak-peak 0 V to 20 V, -10 V to 10 V, -20 V to 0 V 1 x BNC (CH1) and 1 x LEMO (CH2/CH3/CH4) 24-bit ADC 0 mA or 2.2 mA (configurable), 24 V maximum Warns if short circuit or not connected	Simultaneous sampling  Allows for $\pm 8$ V sensor output swing ( $\pm 80$ g) e.g. for reading prox-probe gap Safety feature: Break-free inline connector  2.2 mA required for IEPE/ICP®-type accelerometer
<b>Tachometer</b> Sensor Laser sensor range Other Sensor types supported Power supply to sensor TTL Pulse rating Keyphasor® threshold Speed range	Laser sensor with reflective tape included in kit 10 cm to 2 m nominal Contact, TTL pulse, Keyphasor® 5 V, 50 mA 3.5 V (4 mA) min, 28 V (5 mA) max, off-state 0.8 V 13 V $\pm$ 1 V 10 RPM to 300 000 RPM (0.2 Hz to 5 kHz)	Sensor triggers on beam reflection Depends on size of reflective tape vb has optically isolated input Battery voltage with current limit
<b>Parameter Indication</b> Maximum levels Dynamic signal range Harmonic distortion Units Magnitude & Cursors Accuracy Frequency response	> 1000 g (10 000 m/s <sup>2</sup> ), > 1000 in/sec (25 000 mm/s), > 100 in (2500 mm), > 10 000 Amps > 95 dB (typical at 400 line resolution) Less than -70 dB typical g or m/s <sup>2</sup> , in/s or mm/s, mil or mm or $\mu$ m Overall RMS value, dual cursors, harmonics $\pm$ 1% (0.1 dB) $\pm$ 0.1 dB from 10 Hz (AC) or 0 Hz (DC) to 15 kHz; $\pm$ 3 dB from 1 Hz (AC) or 0 Hz (DC) to 40 kHz	Effective limit is sensor sensitivity and output voltage  Other distortions and noise are lower 0-peak, peak-peak or RMS. Auto-scale by 1000x when required Digital readouts on chart For DC level (%F.S.) & AC measured at 100 Hz Acceleration and velocity. From value measured at 100 Hz
<b>Spectrum Display</b> Fmax possible ranges Fmin possible range Resolution Frequency scale Amplitude scale Window shapes Overlap Number of averages Averaging types	25, 50, 100, 125, 150, 200, 300, 400, 500, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000 Hz 0 to Fmax 800 lines Hz, CPM, Orders Acceleration, velocity, displacement Hanning 50% 4 Linear	Or equivalent CPM values Or orders-based from 1X to 999X vb instrument zeroes all spectral lines below Fmin  Linear scale with zooming Linear or log scales, auto or manual scaling
<b>Waveform Display</b> Number of samples Time scale	2048 160 ms to 32 seconds	Or orders based from 1 to 999 revs
<b>Logging Features</b> Output formats Data storage Data storage structure Max Folder size Direct print reports USB Host	vb screen 1 GB non-volatile flash memory Folders / machines / points / locations 10 000 measurement locations Via Ethernet to PCL-enabled printer 2.0 to external USB memory device	Virtually unlimited recording storage! No limits are applied, 50 character names
<b>Balancing</b> Planes Speed range Measurement type Weight modes Remove trial weights Manual data entry Storage Channel selection	2 planes, 4 sensors 30 RPM to 60 000 RPM Acceleration, velocity, displacement Angle 0° to 360°, fixed position, circumference arc Yes/No Yes Against machines in data structure Up to 4 channels simultaneously	e.g. weights on fan blades, linear dist. around circumference Automatic recalculation Allows re-entry of previous balance jobs No limits are applied
<b>Display &amp; Communications</b> Display Resolution Viewing area Backlight Communications with PC USB host	Graphic Grayscale LCD 480 x 320 pixels (HVGA) 4.6" x 3.1" (117 x 79) mm White LED, 4V, 100 Cd/m <sup>2</sup> USB and Ethernet 2.0 to external USB memory device	PROFLASH allows vb software to be upgraded Save folders to USB flash drive

Specifications	Model vbBalancer+	Remarks
<b>Battery &amp; Charger</b> Battery Type Operating time Charger type Charge rate	Custom Lithium Ion pack, 7.4 V, 4500 mAh 10 hours Internal charging, automatic control 3 A nominal	Backlight on (60 second timeout) External Power pack 12 V DC, 3 A output, included in kit 3 hours for complete charge
<b>Mechanical</b> Size Weight	9.9" W x 5.8" L x 2.4" H (252 x 148x 60) mm 2.7 lb (1.2 kg)	Including battery and strap
<b>Environment</b> Operating Temp Storage Temp & Humidity EMC Ruggedness Hazardous Locations Certification	14 °F to 122 °F (-10 to 50) °C -4 °F to 140 °F (-20 to 60) °C, 95% RH EN61326 4' (1.2 m) drop onto concrete, IP65 CSA Class I, Division 2 (Groups A, B, C, D) CE, C-Tick	Procedure: 26 drops following MIL-STD-810F-516.5-IV

Revised 3 November 2010. While every effort has been made to provide the most accurate information we advise that information in this document may contain technical inaccuracies or typographical errors. Commtest Instruments Ltd may at any time and without notice make improvements and/or changes to the products described.

# Index

## A

### Accelerometer

- drive current • 6, 107
- sensitivity • 29
- setting up • 31
- specifying settings • 107

### adB • 73

- scaling • 72, 73
- units • 73, 77

### Amplitude

- scale • 72
- units • 73, 77

### AR (against rotation) • 47

### Averaging • 46, 84

- overlap • 84

## B

### Back up a database • 137

### Balance weights • 42, 46

- placing • 47

### Balancing

- against rotation • 47
- circumference arc • 42

### degrees • 42

### fixed positions • 42

### initial reading • 38, 44, 54

### printing reports • 130

### reference mark • 42, 44, 46

### report • 52, 61

### trial reading • 38, 55

### trim balance • 38, 48, 59

### units • 48

### walk-through • 53

### WR (with rotation) • 47

## Battery

### conserving power • 118

### features • 13

### recharging • 13

### removing • 14

## C

### Channels • 70

### assigning sensors to • 81, 92

### multi-channel measuring • 92, 93

### Charts • 66

### scaling • 72, 73, 77

### working with multiple charts • 70, 71

### zooming • 69

Zooming charts • 69  
Copying items • 27, 106  
Cursors • 67

## D

Date and time • 114, 115  
Deleting items • 107  
    all stored information • 113  
    folders • 102  
    notes • 112  
    recordings • 99, 113  
    restoring • 102  
    sensors • 110  
Delta • 67  
Drive current • 6, 107

## F

Fixed positions • 42  
Fmax • 82, 83  
    equivalent Fmax • 84  
Fmin • 83  
Folders, defining, working with •  
    101, 102

## H

Harmonic cursors • 67

## I

Incompatible sensor • 107  
Initial reading • 38, 54  
Instrument capabilities by model •  
    4  
Instrument I/O ports • 10

## K

Keyphasor • 35

## L

LCD screen • 115, 116  
Log range • 72

## M

Machines, defining, working with  
    • 103  
Measurements  
    measurements analyzing • 66  
    saving • 75  
    taking • 62, 63  
Memory, capacity • 100, 122  
    available amount • 119  
    deleting all information • 113  
    freeing up • 122  
    use of • 83, 84

## N

Notes • 110

**O**

- Orbit Plot • 90
- Orders • 74
- Overall (power level) • 77
- Overlap percentage • 84

**P**

- Parameter sets, defining, working with • 79, 80
- Phase angles • 87
- PROFLASH, firmware upgrading • 136

**R**

- Recordings
  - deleting • 99, 113
  - multi-channel • 92, 93
  - reviewing • 97
  - saving • 97
  - taking • 95
- Report, balancing • 52, 61
- Resetting the instrument • 141
- Resolution • 83, 84
- Revs, waveforms • 75
- RPM, setting • 74
  - rpm displaying • 87

**S**

- Sensors
  - bias voltage • 109
  - connecting • 30
  - mounting • 31
  - sensitivity • 29
  - supported types • 29
- Settling time • 107
- Spectral lines • 83

**T**

- Tachometer • 33, 87
  - triggering • 84
- Trial reading • 38, 55
- Trim balance • 38, 59

**U**

- Upgrading the instrument • 136

**V**

- vbXManager • 125, 126, 130, 136
- vdB • 73
  - scaling • 72, 73
  - units • 72, 73

**W**

- WR (with rotation) • 47