



SBS Portable Balancer SB-1700 Series

L-1750-2

Operation Manual



Operation Manual

SBS Portable Balancer

Covering Models:

SB-1700
SB-1700-A
SB-1700-B
SB-1700-C
SB-1700-D
SB-1700-E
SB-1700-F

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Introduction

Congratulations on purchasing your SBS Portable Balancer.

This product was designed to aid users of rotating equipment, by making balance analysis and manual correction of imbalance fast and easy.

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

If at any stage you have any questions not answered by this manual or any suggestions, please feel free to contact us at our website,

www.schmitt-ind.com

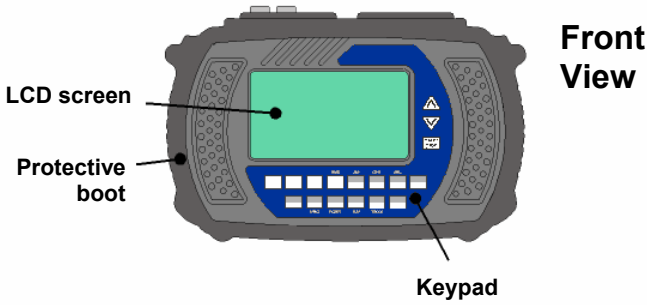
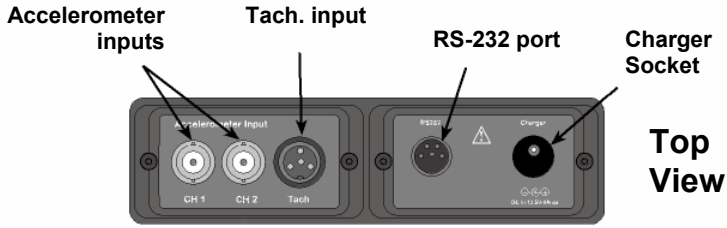
Standard Features

- DSP for fast, accurate calculations
- 16-bit A/D converter providing high-precision measurements
- Displacement, velocity, and acceleration measurements
- Frequency- and time-domain measurements
- 8.5MB non-volatile memory capable of storing balance data for 200 separate machines/ measurements.
- Time- and date-stamped recordings
- PROFLASH-upgradeable firmware
- Temperature-compensated graphical LCD with 240x128 pixels and electro-luminescent LCD backlight
- 1500mAh Ni-Cad (Nickel-Cadmium) battery pack
- Battery charger and conditioner
- RS232 interface to communicate with PC (Personal Computer)
- Tachometer input for speed and phase measurements
- Two plane balancing (second vibration sensor required)

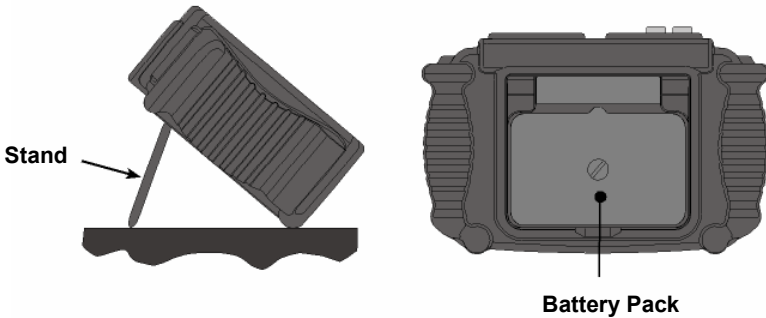
Standard Kit Items

- Portable Balancer with protective boot and strap
- Power transformer, Input varies by country (output: $13.5 \pm 1.5\text{VDC}$, 1A)
- Serial data-transfer cable
- Accelerometer w/ cable (2 required for 2-plane operation)
- Accelerometer magnetic mount base
- Laser Tachometer w/ cable (10 ft/ 3m)
- Laser Tachometer extension cable (10 ft/ 3m)
- Operation Manual/Reference Guide
- Carry bag





Summary of Parts



Back View (stand removed)



List of Instrument Icons

-  The battery is running low and needs charging.
-  (top left) Viewing data locations from Load/ Save Balance.
-  (top left) Viewing data locations from Review Spectrum.
-  Please wait while data is collected

Precautions

WARNING: Please read and understand this section before operating your instrument. Not heeding the warnings or recommendations could result in data loss, data inaccuracy, damage to the instrument, or injury to yourself.

WARNING: Do not attach the accelerometer or tachometer to any object that is connected to a high voltage i.e. a voltage that exceeds 50VDC or 32VAC or the “safety extra low voltage” (SELV) defined by your local power authority.

WARNING: Ensure the cables and bootstrap cannot be entangled with any rotating or moving machinery.

WARNING: Do not operate the instrument in an explosive environment.

CAUTION: Mount the accelerometer properly before taking measurements or recordings (see: Accelerometer Setup Section). Otherwise, the data will be erroneous and/or inconsistent.

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

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

CAUTION: Constantly charging the battery when it is not fully drained will create a “Memory” effect and eventually shorten the amount of charge that the battery can hold. Please read Section 4: Battery Management to learn how to prevent this.

CAUTION: Transfer data stored in the instrument to a PC before reprogramming the instrument - proflashing the instrument with new firmware may erase all data stored in the instrument.

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

CAUTION: Do not use alcohol or any organic solvents to clean the instrument.

CAUTION: Do not expose the instrument or the accelerometer magnetic mounting base to large impacts or pressure.

CAUTION: Do not place the portable balancer or the magnetic mounting base in a hot place where the temperature exceeds 140°F (60°C), otherwise the battery pack or magnet will degrade.

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

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

CAUTION: Use only an approved instrument power transformer (13.5 ± 1.5VDC, 1A output) and ensure its voltage and frequency rating matches that of your mains AC power.

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

Power up / Unit Reset

WARNING: Read Precautions section before operating your instrument.

Pressing the ON/OFF key will power up the unit, or turn it off. If the unit will not respond to any key press, reset the unit by pressing both the On/Off and RESET keys simultaneously.

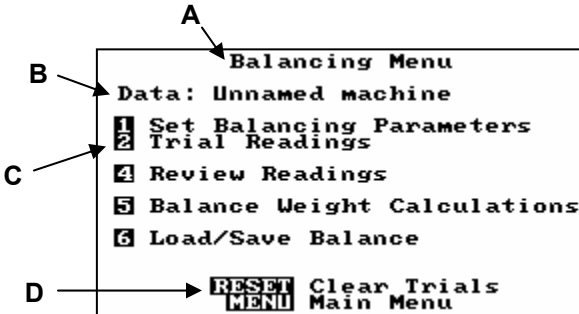
The following screen is displayed at unit power up. The displayed Firmware version and creation date will reflect the currently installed firmware in your unit. Updated firmware versions can be downloaded from the website shown.



After five seconds, the power up screen will be replaced by the main menu screen of the unit. Pressing the MENU key will bypass the power up screen.

Menu Navigation

Most screens found on the SBS Portable Balancer follow a standard format, making menu navigation easy and intuitive. The following describes the components of a typical screen.



A) Screen Title is displayed at top of each screen.

B) Data: (current set) – This label will be found on most screens within both Monitor Vibration and Balancing Menu screens. It indicates the name of the memory location most recently loaded (data was retrieved from this location). A value of “None” indicates that no data has been loaded.

C) Navigation of all menus is accomplished by pressing the number key corresponding to the number (shown in reverse type) of the chosen menu item.

D) Key prompts are displayed at the bottom of each screen as needed. Pressing the MENU key always returns the user to the previous menu.

Pressing the SHIFT key, followed by one of the yellow colored keys (or pressing both simultaneously) will access the function labeled in yellow on that key.

Enter Text/ Numbers

Entering text or numbers is accomplished by pressing the corresponding number key. Available character options for each key will be displayed in turn with subsequent key presses (e.g. first press of the “3” key displays “3”, second press displays “D”, next press displays “E”, etc.). Pressing another key will enter the currently displayed character and proceed to selection of the next character. To enter a character without pressing another key (e.g. when entering the same character two or more times), the user can:

- 1) Use the forward arrow (Shift + 0) to enter the character
- 2) Wait a few seconds, and the displayed character will be entered.

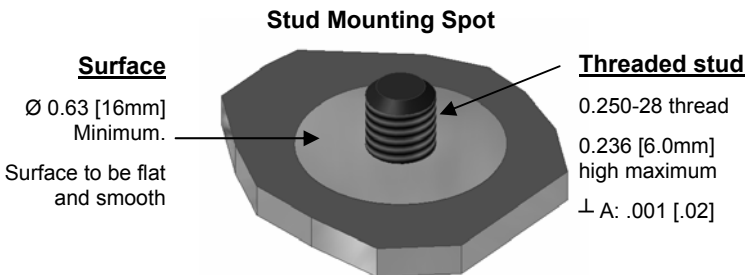
Sensor Setup

Vibration Sensor (Accelerometer)

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

Attach the accelerometer to the measurement point, ensuring:

- Attachment to a sturdy, rigidly mounted, and non-flexible structure, where vibration from the rotating part of the machine (rotor) will be accurately transmitted. Avoid attachment to sheet metal, guards, or any machine structure which is not closely coupled to the source of vibration in the spinning rotor.
- Attachment to a structure which is at least 10 times heavier than the sensor itself. Do not mount the accelerometer on lightweight motors or similar parts, as the weight of the accelerometer will distort the vibration signal.
- Attachment as closely as possible to, and in line with, the machine bearings.
- The sensor is orientated correctly, as vibration in one direction can vary from vibration in another direction.
- Attachment to exactly the same spot as prior measurements, if data is to be used as part of an ongoing study or comparison.
- Accelerometer is securely attached to the mounting surface. The surface should be flat and smooth where the sensor makes contact. Attachment can be either via the supplied magnetic accelerometer base, or via a threaded stud into the machine surface. To mount using the stud method, prepare a mounting spot on the machine, following the specifications shown in the figure. Unscrew the magnetic base from the accelerometer, and screw onto the threaded stud. Use of thread locking compound is suggested.



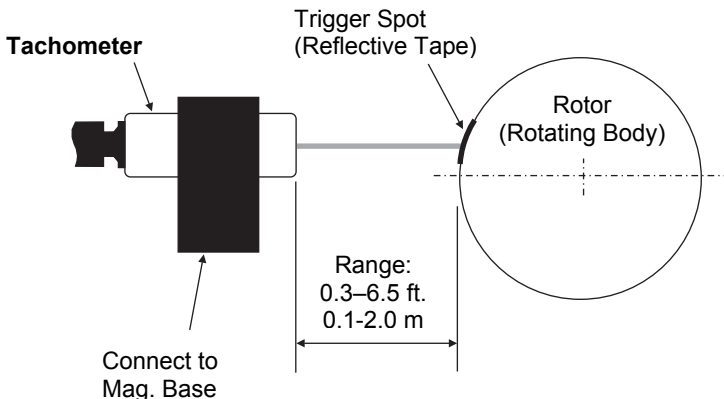
Caution – Tighten the accelerometer finger tight only. Do **NOT** use a wrench to tighten the accelerometer as this will damage the sensor.

Tachometer

The tachometer provides information on the speed or rotation, and the phase relationship between measured vibration and the spinning rotor. This information is important in determining placement of balance weights. The laser tachometer included with the SBS Portable Balancer is easy to setup and use.

- 1) Stop the rotating machine.
- 2) Select or provide a spot on the rotor as a trigger spot. This spot should provide a pronounced increase in reflection as it passes under the laser. This is easily accomplished by placing a piece of the supplied reflective tape on the rotor, at a convenient location on the rotor. The tape width must be **at least** double the diameter of the laser spot.
- 3) Mount the laser tachometer to the supplied adjustable magnetic base. Mount the base to a stationary portion of the machine, convenient to the trigger spot. The sensor should be positioned within the measurement range shown in the diagram below.
- 4) Connect the sensor cable to the Portable Balancer.
- 5) Turn on the laser tachometer on, and adjust the magnetic base to align the laser beam to the trigger spot. To turn the laser on, navigate the menu as if performing a vibration measurement, either:
 - a) Monitor Vibration Menu > Measure Balance > Enter
 - b) Balancing > Trial Reading > Initial Reading > Enter

Press Enter again after alignment is completed, to finish end measuring and press MENU key to exit back to Main Menu.



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

Main Menu

The main screen provides access to the portable balancer's main operational tasks.



1) Monitor Vibration Menu – Allows the user to measure and record vibration/ balance levels on various machines, or under various conditions. The user can also measure and record broadband vibration spectrum data for machines. The user can save both types of measurements to user labeled memory locations, and retrieve these measurements later from storage.

2) Balancing Menu – Allows the user to perform the same measurement functions under the Monitor Vibration Menu, but also provides balance analysis and various types of balancing methods and tools.

3) Balance Reports – Allows the user to download current data and stored data from the portable balancer to a PC for recordkeeping or additional analysis.

4) Utilities – This menu allows the unit's clock to be programmed with the current date and time. The current time is shown to the right. This menu allows the Power saver mode to be turned ON or OFF, and manual control of the battery charge function. The percentage shown to the right is the percent of battery life remaining. This menu also allows the user to erase the unit memory.

Monitor Vibration Menu

The Monitor Vibration Menu permits quick measurement of both broadband vibration spectrum and balance level measurements on a machine. Balance level measurements are taken at the rotational frequency of the machine. The ability to save both types of data to named memory locations is included. The screen includes the following elements:

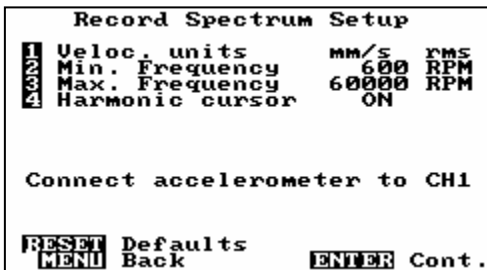


Current: (values)

This bottom section of this screen displays the results of the most recent balance level measurement. The measured vibration level is displayed to the right of the word Current. Below this, the current vibration units and phase are displayed. The RPM level of the last measurement is displayed below this. (see: *Set Balancing Parameters* section for detail on available vibration units)

Measure Spectrum

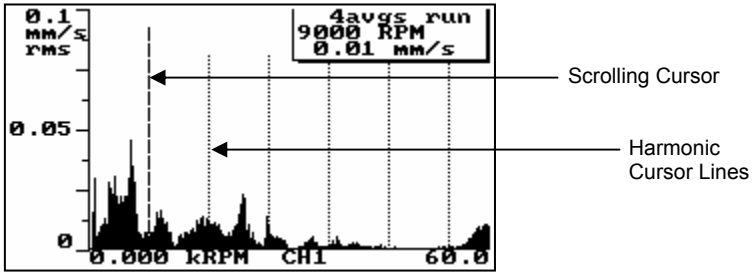
This selection permits the user to enter specifications to be used in measuring a broadband frequency vibration spectrum. This information can be useful for machine diagnostics, especially determining vibration sources at frequencies other than the spindle rotation speed.



- 1) Sets the vibration units to be used in the spectrum measurement.
- 2) Sets the low end frequency of the spectrum range.
- 3) Sets the high end frequency of the spectrum range.

4) When harmonic cursor is ON, the scrolling cursor on the Spectrum Plot screen will additionally include indication of all frequencies which are harmonic multiples of the frequency currently selected by the scrolling cursor.

Pressing ENTER will start the measurement process, and produce the following spectrum plot screen.



While this screen is displayed, the vibration spectrum is continuously measured and updated. The scrolling cursor is the first vertical dashed line shown above, and the frequency selected by the cursor (9000 RPM) is shown in the top right corner. Prior to moving the cursor, the top right corner will display the broadband vibration measurement for the whole range under measurement. The other vertical dotted lines shown are the harmonic multiples of the cursor selected frequency (shown when harmonic cursor setting is ON). The scrolling cursor is displayed and moved by using the < and > keys.

Press ENTER from this screen to record a snapshot of the vibration spectrum in one of the 200 individual memory storage locations (same locations are accessible under both Monitor Vibration and Balancing Menus). Current data can be saved to these locations, and later retrieved for comparison or use.

Review Spectrum

This option allows to user to retrieve a saved vibration spectrum for review or output. The following screen is displayed, and the user can then select which named data location to retrieve data from.



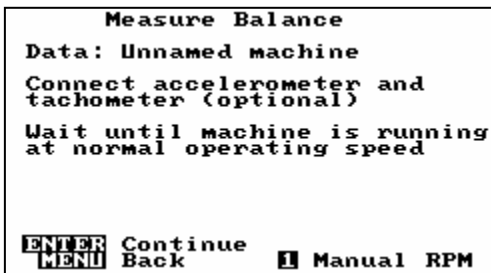
The ✓ symbol next to the name of a data location indicates that spectrum data is stored there.

The □ symbol next to the name of a data location indicates that balance level data is stored there.

For details on naming and using data locations, see the Load/ Save Balance section.

Measure Balance

To perform a vibration measurement, select Measure Balance. First an instruction screen is displayed, indicating the need to connect the vibration sensor and optional tachometer before measuring. (see: *Sensor Setup*)

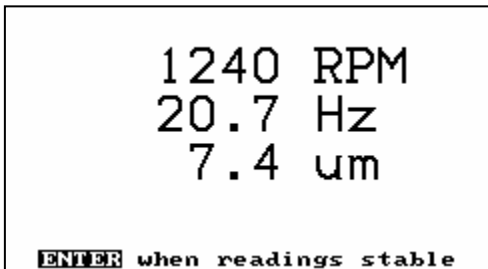


Using the tachometer is optional when simply monitoring vibration levels. The user can choose to manually enter the RPM (where known) of the equipment being measured, instead of using the tachometer. (see: *Manual RPM for details*)

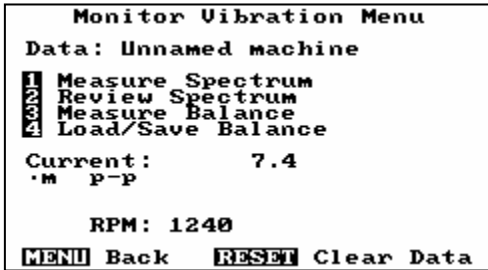
Once connected and the machine is running at speed, press ENTER to begin measuring.

Running Values Screen

The following screen is displayed while measuring. A message will appear at the bottom of the screen for a few seconds “Hardware is Stabilizing...”. Once this message clears, the screen reads as shown. Press ENTER to record these values to current memory.



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



Manual RPM

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



From the instruction screen, select 1) Manual RPM to allow manual input of an RPM number. Use the number keys to enter the desired RPM level on the following screen, and press ENTER to continue.

Load / Save Balance

Allows user access to 200 individual memory storage locations (same locations are accessible under both Monitor Vibration and Balancing Menus). Current data can be saved to these locations, and later retrieved for comparison or use.

Current data – The data currently in the unit’s active memory. This data is either the results of recent measurements, or data which was loaded into active memory from one of the 200 storage locations.

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

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

To name a data location, select the desired memory location from the displayed list (#1-200). Use the up/down arrow keys to scroll from one location to the next

on the screen. Press SHIFT with the up/down arrow keys to scroll by units of 10. Press and hold the arrow keys to accelerate the scroll speed.



Once a memory location is selected, the possible operations include:

1) **LOAD** data stored in the memory location into the unit's current memory.

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

2) **EDIT** the name of the memory location. Use this function to create and edit names for each memory location in use. The name should clearly indicate the contents of the data to be stored. Users may choose to store measurements by machine, date, or other criteria as needed.

The screen prompts indicate what options are available for data entry.



Text/ Numbers - Use the number keys to enter letters and numbers (see: *Enter text/ numbers*). Press the up/down arrow keys to change the case of letters entered.

Punctuation/ Symbols – Before pressing any other key, use the up arrow key to scroll through the available symbols.

Insert/ Delete – Use the yellow “+” key to insert spaces at the cursor, and the “-” key to delete characters at the cursor.

Space – Press 0 key twice in quick succession (within 2 seconds) to enter.

Right/ Left – Use the yellow left/right arrow keys to move.

Clear text – Press RESET once to clear everything from the cursor right. Press RESET a second time to clear the entire name.

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

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

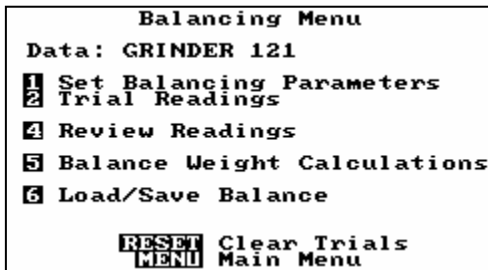
4) DELETE a memory location's contents. This will erase all data stored in a memory location, but will leave the name of the location unchanged. To eliminate the name, choose to EDIT the selected name, and clear by pressing RESET

RESET - Clear Current Data

From the main Monitor Vibration menu, the user can clear current data in memory by pressing RESET. The first time RESET is pressed, all saved readings will be erased. Pressing RESET a second time will clear all settings from the current memory, as well as the name of the memory location last loaded.

Balancing Menu

The Balancing Menu is accessed from the unit's main menu. This menu allows the user the same ability to take measurements, and save data as the Monitor Vibration menu does, but adds functions to allow the user to perform balance analysis and compensation.



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

- **Setting Parameters** – Select units and balancing method.
- **Initial Reading** – A measurement of the unbalance is taken in each plane.
- **Trial Weight Reading** – A trial weight is attached to the balancing plane and another measurement is taken. For two-plane balancing, the same is done for the second plane also.

- **Balancing** – Correction weights are attached to the balancing plane(s) as recommended by the SBS Portable Balancer.
- **Trim Balance** – A measurement is taken in each plane to confirm that the rotor is balanced. Any residual unbalance can be removed via additional trim balance cycles.

Set Balancing Parameters

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

```

Set Balancing Parameters
Data: None
1 Number of planes          1
2 Angle Measurements       WR
4 Filter Bandwidth         Wide
5 Display Units            Displ.
   MM P-P
6 Balance Solution Type:
   2 Equal Weights
[RESET] Defaults   [ENTER] Cont.
  
```

1) Number of Planes

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

2) Angle Measurements

A submenu allows selection of the scale direction used to position balance weights on the equipment being balanced, relative to the rotation direction of the rotor. The choices are:

```

Angle Measurements
ANGLE SCALE
  0°
  ↻
  270°  90°
  ROTATION
  180°
[With Rotation (WR)]
[Against Rotation (AR)]
[Select] [ENTER] Continue
  
```

AR (Against Rotation) – Balance weights are positioned on a scale which runs the **opposite direction** (clockwise or counterclockwise) as the machine rotation.

WR (With Rotation) – Balance weights are positioned on a scale which runs the **same direction** (clockwise or counterclockwise) as the machine rotation.

Required Weight Position Reference System

Performing balancing operations on a rotating body depends on the user establishment of a positioning system for balance weights. The more accurately this reference system is established, the more accurate balancing operations will be. This position reference system can be accomplished by:

1) Marking an angle scale on the rotating body (0-359°) and determining a fixed radius from center of rotation where balance weights can be added or positioned anywhere on the radius (e.g. sliding weights). Such an angle scale is also needed for single point balance solutions, where the user will add or remove weight from a single point, at a given angle.

2) Establish a fixed number of attachment points (e.g. drilled and tapped holes) which are equally spaced on a fixed radius on center with rotation.

3) Remove Trial Weight

Toggles whether the trial balance weight will be removed from the machine after the trial balance reading (yes or no). When using 2 or 3 equal weight solutions, this setting is not available, as the trial weight will be one of the balance weights, and will be moved to a new position as indicated by the portable balancer.

4) Filter Bandwidth

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

5) Display Units

Allows various settings for vibration units to be selected.

Balancing Units	
1 Quantity	Displ .
2 Displ. unit	µm
3 Amplitude type	pk to pk
ENTER Continue	

Units available include: (press number key to toggle setting)

1) Quantity	Displacement	Velocity	Acceleration
2) Units	μm , mm, mil	mm/s, in/s	g, m/s^2
3) Amplitude	peak-peak, RMS, 0-peak		

6) Balance Solution Type

Selects one of four methods of adding or removing weight to the rotor when performing balancing. The current setting is displayed on the Balance Parameters screen.

2 Equal Weights Two equal weights will be used, and positioned at variable angles, e.g. sliding weights.

3 Equal Weights Three equal weights will be used, and positioned at variable angles, e.g. sliding weights.

Single Point A variable amount of weight will be positioned at a single point specified by the portable balancer. An alternative exists to remove the same weight from a position spaced 180° , e.g. by drilling out material.

Fixed Positions Variable amounts of weight will be added to equally spaced pre-determined positions, such as a bolt circle of drilled and tapped holes. The number of fixed positions can be set from 3 to 99.

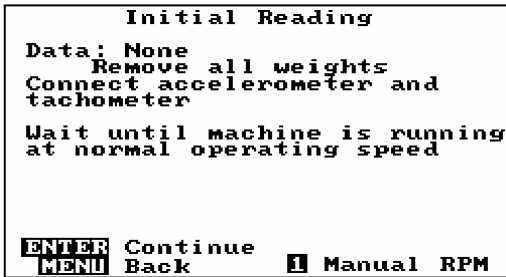
The different solution types will use the same basic screens and steps in balancing, but the details of some screens will vary to convey different information. The three equal weights solution will be used as an example in the following explanation.

Trial Readings

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



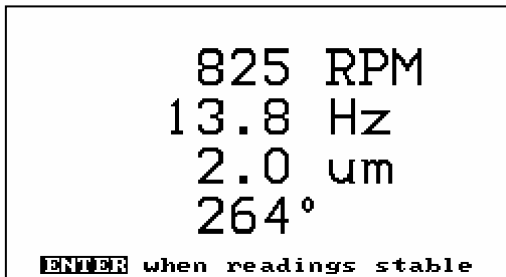
Press 1) to perform an initial measurement of unbalance, which defines the starting point of the balancing procedure. An instruction screen is displayed,



indicating the need to remove all balance weights from the machine, connect the vibration sensor and tachometer, and bring the machine to normal operating speed before conducting the measurement.

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

Once these conditions are met, press ENTER to begin measuring. Once the measurement readings have stabilized, press ENTER again to record values.



The Trial Readings screen will again be displayed, but an additional menu options is now available.

```

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

Initial      2.0
MM P-P      265°
Trial

MENU Back

```

Press 2) to proceed to the Trial Weight Reading. The user is instructed to stop the machine rotation, attach a trial balance weight at the zero position, and restart machine rotation. The position of the trial weight will define the zero reference point used for subsequent balance calculations. All subsequent instructions to position weights will be relative to this zero point.

```

Trial Weight Reading
Data: None
Add a balance weight at the
zero position
Connect accelerometer and
tachometer
Wait until machine is running
at normal operating speed

ENTER Continue
MENU Back

```

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

```

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

Initial      2.0
MM P-P      265°
Trial        3.0
MM P-P      295°

MENU Back

```

Now exit the Trial Readings Screen and return to the Balancing Menu, by pressing MENU.

Balance

With Initial and Trial readings completed, the Balancing Menu will display the Balance option. Press 3) to proceed with balancing.

```

      Balancing Menu
Data: None
[3] Set Balancing Parameters
    Trial Readings
    Balance
    Review Readings
[5] Balance Weight Calculations
[6] Load/Save Data
[7] Output Report
      [RESET] Clear Data
      [MENU] Main Menu

```

The Balance Screen displays the balance solution, based on the balance solution type chosen. At this point the user can select an alternate type of balance solution from the Balance Parameters Menu if needed, and the unit will translate the balance results using the new solution type.

```

      Balance
Data: None
To balance, place weights as
indicated:
      Weight1  201° AR
      Weight2  116° AR
      Weight3   31° AR
[1] Perform Trim balance
      [MENU] Balancing Menu

```

Position or remove balance weight(s) on the machine as indicated by the portable balancer, and then proceed to Trim Balance.

Trim Balance

Restart the machine before pressing 1) to begin Trim Balance. Trim Balance will take another measurement to confirm the balance level achieved when the weights were positioned.

```

      826 RPM
      13.8 Hz
      0.3 um
      202°
[ENTER] when readings stable

```

The results of this measurement are displayed. Take note of the Balance Level displayed, and determine if this level is adequate. Pressing Enter will record this Trim balance level and return the user to the Balance screen.

The user has the choice to end balancing at this point, or continue with another re-position of balance weights as indicated in an attempt to improve on the balance level.

The trim balance process can be repeated until the user is satisfied with the results, or no further reduction of imbalance can be achieved.

Review Readings

This screen simply lets the user review the results in current memory of the latest Initial Reading, Trial Reading, and Trim Balance Reading. These values can be saved to or loaded from data storage as described in the Load/ Save Data section of this manual.

```

          Balance
Data: None
To balance, place weights as
indicated:
      Weight1  202° AR
      Weight2  120° AR
      Weight3   38° AR
1 Perform Trim balance
      MENU Balancing Menu

```

Balance Weight Calculations

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

Suggest Trial Weight

This tool aids the user in determining the appropriate amount of suggested

```

          Suggest Trial Weight
1 Rotor Weight      100 kg
2 Rotor Diameter    100 mm
3 Rotor Speed       100.0 Hz
Suggested Weight     5 g

6 Select mass units
7 Select diameter units
8 Select speed units
9 Suggested weight units
      ENTER Continue

```

balance weight to use, based on the weight, diameter, and speed of the spinning portion (Rotor) of the equipment being balanced. The user also has the option of using different units of measure for the mass of the Rotor (lb, oz, kg), the Rotor

diameter (in, mm), the Rotor speed (hz, rpm), and the Balance Weight units (oz, g). Note that changing from one unit to another does not directly translate the associated value. The user will need to reset the value as needed to match the application.

Split weights

This tool allows the user to take a calculated single point balance solution (correction weight and angle), and translate it into a two weight (split weight) solution, where the user defines the two new correction angles, and the resulting balance weights at each angle are calculated.

Combine Weights

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

Change Radius

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

ISO-1940 Limits

This tool provides determination of the maximum permitted unbalance level, based on input of the Rotor weight, Rotor diameter, and Rotor speed. Various severity specifications (g specs.) under this ISO standard are supported (G0.16, G0.40, G1.00, G2.50, G6.30, and G16.0). Units of measure are selectable.

Drill Depth Calculator

This tool is a useful feature when performing single point balance by removal of material. The screen calculates the drill depth needed to remove the required amount of weight from a rotor, based on user specified drill size information and material density.

Use the Single Point Balance calculation to determine the amount of weight to be removed to achieve balance. On the Single Point Balance results screen, refer to the remove weight amount and remove angle (given in parenthesis).

RESET - Clear Current Data

From the main Balancing Menu, the user can clear current data in memory by pressing RESET. The first time RESET is pressed, only TRIM Balance data will be erased. This allows the user to load saved data from a machine, thereby loading all parameter settings for that machine, and then clear the TRIM data to begin a balance operation. Pressing RESET a second time will clear all TRIAL data from the current memory. Pressing RESET a third time will clear all data from current memory, including the name of the memory location last loaded.

Balance Reports

This menu allows current data and stored data to be downloaded from the portable balancer to a PC for recordkeeping or additional analysis. To download, use the supplied serial cable to connect the RS-232 port on the portable balancer with a COM port on a PC, and run HyperTerminal (under Accessories on Windows systems) or any other terminal communication program. Use the following settings for the COM port:

Baud Rate: 57600
Data Bits: 8
Parity: None
Stop bits: 1
Flow Control: Hardware

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

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

Report output will not include the above columns headers, but will look like the following for each report option:

Standard Report – Current Data

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

Current Data , 11 OCT 02, 11:04:31am, Initial, Plane1, 16.0, um p-p, 298
Current Data , 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3, um p-p, 234

Standard Report – All Data

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

Current Data , 11 OCT 02, 11:04:31am, Initial, Plane1, 16.0, um p-p, 298
Current Data , 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3, um p-p, 234

GRINDER 9 , 11 OCT 02, 11:04:31am, Initial, Plane1, 18.0, um p-p, 278
GRINDER 9 , 11 OCT 02, 11:04:31am, Residual, Plane1, 1.3, um p-p, 210

...followed by all other saved memory locations.

Extended Report – Current Data

(All balance data reported - current memory only).

Current Data , 11 OCT 02, 11:33:04am, Initial, Plane1, 5.0, um p-p, 227
Current Data , 11 OCT 02, 11:33:04am, Initial, Plane2, 4.3, um p-p, 227
Current Data , 11 OCT 02, 11:33:04am, P1 Trial, Plane1, 12.8, um p-p, 199
Current Data , 11 OCT 02, 11:33:04am, P1 Trial, Plane2, 10.5, um p-p, 199
Current Data , 11 OCT 02, 11:33:04am, P2 Trial, Plane1, 11.0, um p-p, 233
Current Data , 11 OCT 02, 11:33:04am, P2 Trial, Plane2, 9.5, um p-p, 233
Current Data , 11 OCT 02, 11:33:04am, Residual, Plane1, 0.3, um p-p, 212
Current Data , 11 OCT 02, 11:33:04am, Residual, Plane2, 0.3, um p-p, 212

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

Extended Report – All Data

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

Current Data , 11 OCT 02, 11:33:04am, Initial, Plane1, 5.0, um p-p, 227

Current Data , 11 OCT 02, 11:33:04am, Trial, Plane1, 12.8, um p-p, 199

Current Data , 11 OCT 02, 11:33:04am, Residual, Plane1, 0.3, um p-p, 212

MACHINE#5 , 11 OCT 02, 11:33:04am, Initial, Plane1, 7.4, um p-p, 247

MACHINE#5 , 11 OCT 02, 11:33:04am, Trial, Plane1, 11.2, um p-p, 299

MACHINE#5 , 11 OCT 02, 11:33:04am, Residual, Plane1, 0.4, um p-p, 252

MACHINE#107 , 11 OCT 02, 11:33:04am, Initial, Plane1, 8.4, um p-p, 122

MACHINE#107 , 11 OCT 02, 11:33:04am, Trial, Plane1, 15.3, um p-p, 99

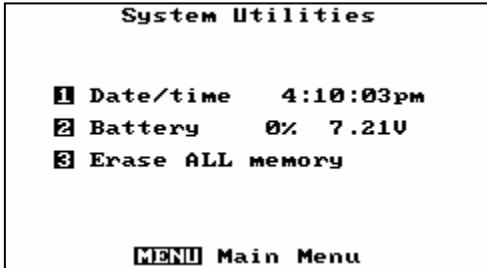
MACHINE#107 , 11 OCT 02, 11:33:04am, Residual, Plane1, 0.4, um p-p, 157

...followed by all other saved memory locations.

Note: shown for Single Plane Balance.

Utilities

Selecting Utilities from the unit's main screen allows access to the following functions:



Set Date/ Time

This screen allows the user to change the current Date and Time used by the SBS Portable Balancer. Press ENTER to select the item to edit. The currently selected item will flash on the screen. Use the up/down arrow keys to change



the value of the currently selected item. Press MENU to save changes and exit screen.

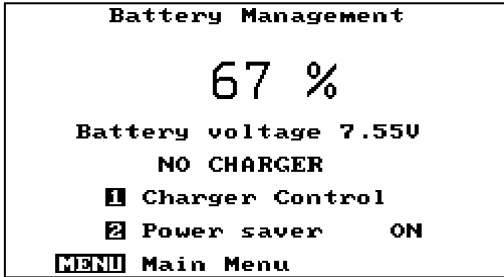
Battery

The SBS Portable Balancer is powered by a rechargeable Nickel-Cadmium (Ni-Cad) battery pack. The normal operating voltage is 6.0 to 8.5 Volts.

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

Below 6.6 Volts, the unit displays a flashing icon at the top left corner of the screen and beeps once every minute as a reminder that the battery pack needs to be charged. In the Battery Management screen, a flashing "Low Battery" message is also displayed. Below 6.1 Volts, the portable balancer automatically turns off the backlight to prevent further power draining. Below 80% battery capacity, the unit automatically begins to charge the battery pack if external power is supplied. At 5.5 Volts, the unit automatically powers down.

Apart from the battery pack, there is an internal backup battery that backs up data and settings in the portable balancer in the event that the battery pack is detached from the unit. The backup battery is kept charged by the battery pack if the battery pack is functioning normally.



The Battery Management Screen displays the current percent of full battery charge available, and the corresponding battery voltage. The “NO CHARGER” text will flash when the transformer is not connected.

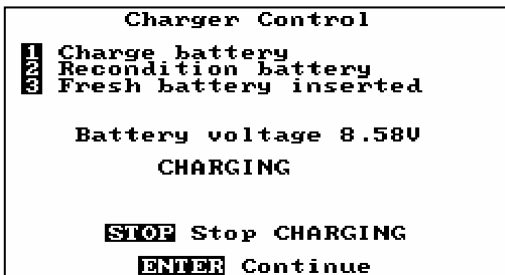
The battery pack can be charged by supplying $13.5 \pm 1.5\text{VDC}$, 1A power to the unit’s charger socket. The power transformer supplied in the kit provides this DC voltage.

Caution: Do not detach the battery pack from the portable balancer for more than 2 hours as this will exhaust the backup battery, causing saved data and settings to be lost.

Caution: Before charging the battery pack, ensure that the power transformer used is an approved model ($13.5 \pm 1.5\text{VDC}$, 1A output) and that the voltage and frequency of your mains AC power supply match that of the power transformer used.

Charger Control

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



Charge Battery

Manually begins battery charging cycle.

Recondition Battery

Fully discharges and then automatically recharges the battery. This reduces the undesirable memory effect in the NiCad battery. The battery should be reconditioned the first time it is used, and once a month thereafter. The recondition process will take up to two hours, depending on initial battery charge.

Fresh Battery Inserted

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

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

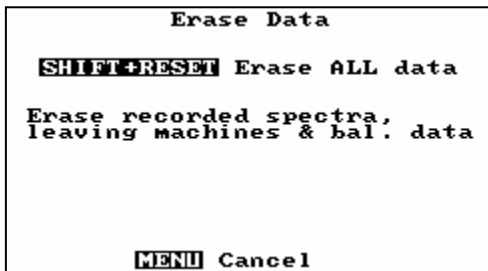
Power Saver

The power saver is another feature that helps conserve power on the portable balancer. This feature is always active by default each time the unit is powered on. The user may choose to turn it off temporarily by selecting the Power Saver Toggle from the Battery Management screen.

Power saver will turn the LCD display off after 8 minutes of inactivity (no key presses). The unit will otherwise continue to function, and any key press will turn the LCD back on. After 15 minutes of inactivity, power saver will power down the portable balancer. If the battery is being recharged, the unit will remain powered on until charging is completed.

Erase ALL Memory

This from this screen, press SHIFT + RESET One time to erase all spectrum data saved in all memory locations.



Pressing SHIFT + RESET a second time will clear all balance data saved in all memory locations, plus clear all names assigned to data locations.

List of Abbreviations

AC	Alternating Current
A/D	Analog-to-Digital
CH	Channel
cpm	cycles-per-minute
DC	Direct Current
DSP	Digital Signal Processor
ESD	Electro-Static Discharge
Hz	Hertz
In	Inches
ISO	International Organization for Standardization
kB	Kilobytes
kcpm	Kilocycles per minute
kV	Kilovolts
LCD	Liquid Crystal Display
MB	Megabyte
mcpm	Megacycles per minute
MHz	Megahertz
mm	Millimeter
ms	Millisecond
Ni-Cad	Nickel-Cadmium
PC	Personal Computer
COM port	PC Serial Port (1-4)
rms	root-mean-square
tach	tachometer
V	Volts