SBS Manual Balance Control

User's Guide

with SB-5500 Series Controls

LL-5900 Rev 1.3

Productivity through Precision™

DYNAMIC BALANCE SYSTEM

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User's Guide and Specifications

For the

SBS Manual Balance Control

Covering Operation of SB-5543 and SB-5544
with Model SB-5500 Series Controls

LL-5900

Manual Revision 1.3
Covers operation with product firmware rev. 0.37

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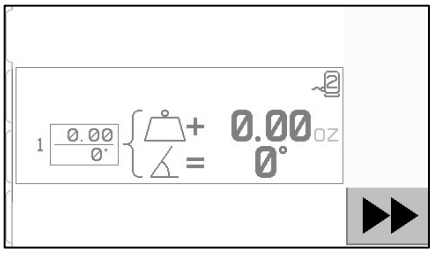
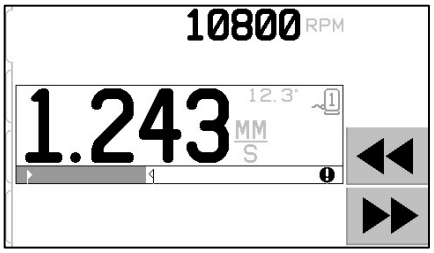
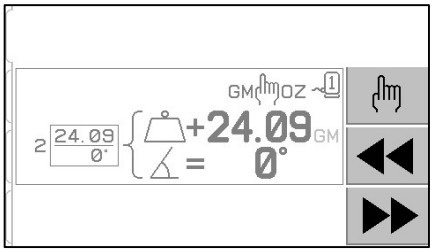
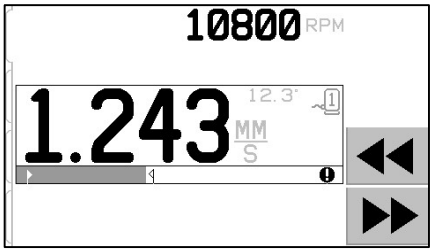
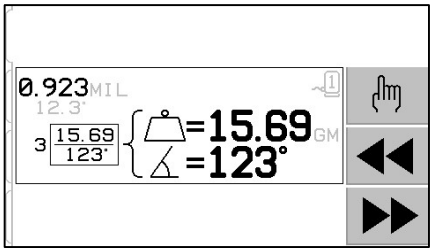
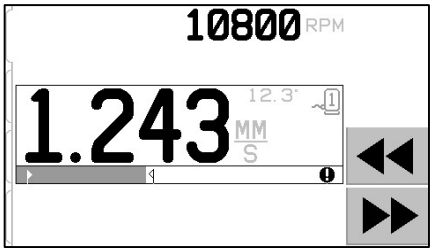
Benefits of SBS System with SB-5500 Control

- Increases throughput by saving setup time.
- Improves part quality by automatically balancing to 0.02 micron.
- All-digital electronic design increases operating life and reliability.
- Easy to install and operate.
- Longer life for grinding wheels, dressing wheels, and spindle bearing.
- Works with existing SBS installations.
- Profibus, Profinet, Ethernet, and USB 2.0 communication.
- International adaptability: voltage, frequency, communication, and display language.
- Four-channel capability reduces costs by permitting balancing of multiple machines.
- Backed by world-class SBS customer service.

Table of Contents

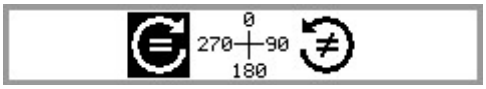
Quick Start for Balancing

1. Calibrate the RPM sensor so the spindle speed is reported on the main screen.
2. Press button to setup controller, including the MENU settings Limit, Tolerance and Critical vibration values, balancing method, and scale direction. Each plane has a separate setup screen. Use SHOW ALL to select the active plane for dual plane applications.
3. Press to start a balance cycle. The screens below are for single point balancing.

	Stop Spindle	Place Weights	Start Spindle	Measure Vibration
Initial Phase (Step 1)				
Test Phase (Step 2)				
		Test mass value and units can be edited.		
Solution Phase (Step 3)				
		Toggles solution between Additive (+) and Absolute (=).		If the resulting vibration is above the Balance Limit, a new solution will be provided to correct the residual vibration. If below, the process ends.

Additive Solution (+) leaves all existing weights and adds only what is shown.
Absolute Solution (=) removes all existing weights then adds what is shown.

If the balance gets worse after the solution phase, check that the scale direction setting is correct.



Introduction

This guide provides the information needed to X.

Note	This guide uses English language setup screens for one specific master as a reference. Your setup screens may vary in layout and language.

System Purpose

In order for the wheel of a grinding machine to accurately cut, produce smooth surface finishes, and generate correct part geometry, it is necessary to prevent vibration in the grinding process. A primary cause of vibration during grinding is the existence of imbalance in the grinding wheel. This is often due to the heterogeneous nature of the grinding wheel, which contains great numbers of unevenly distributed grains, causing intrinsic imbalance. This imbalance can be compounded by eccentric mounting of the wheel, varying width of the wheel, imbalance in the arbor, and coolant absorption into the wheel. Considering all these factors, even a carefully established initial balance will not last long. Furthermore, due to wear and dressing, the rotational dynamics of a grinding wheel are always changing. For these reasons, dynamic balancing of grinding wheels has long been recognized as an important step in the production process.

The SBS Manual Balancer has been developed to provide dynamic balancing for grinding machine operators with the following objectives in mind:

- **Ease and Usefulness of Operation**
- **Maximum Grinding Machine Efficiency**
- **Minimal Installation Requirements**
- **Minimal Maintenance Requirements**
- **Attractive Purchase Price**

Operator Safety Summary

This summary contains safety information necessary for operation of the SBS Manual Balancer for grinding machines. Specific warnings and cautions are found throughout the Operation Manual where they apply, but may not appear in this summary. Before installing and operating the SBS Manual Balancer, it is necessary to read and understand the entirety of this manual. After reading the Operation Manual, contact Accretech SBS, Inc. for any additional technical assistance required.

Warning: Observe all safety precautions for operation of your grinding machinery. Do not operate your equipment beyond safe balance limits.

Warning: Failure to properly attach SBS Manual Balancer components to the grinding machine will result in safety hazard during machine operation.

Warning: Never operate a grinding machine without all proper safety guarding in place.

Caution: To avoid equipment damage, make sure the line voltage is within the range specified for the system (see specification section).

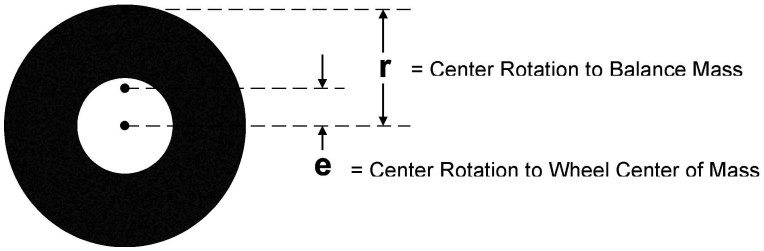
Caution: Only qualified service technicians should attempt to service the SBS Manual Balancer. To avoid electric shock, do not remove the cover of the Control Unit, or remove cables, with power connected.

System Theory and Connection

The SBS Manual Balancer operates on the principle of mass compensation for any given grinding wheel's imbalance. The Intrinsic Imbalance of a grinding wheel is equal to its mass multiplied by "**e**", the distance between the wheel's center of mass and the wheel's center of rotation.

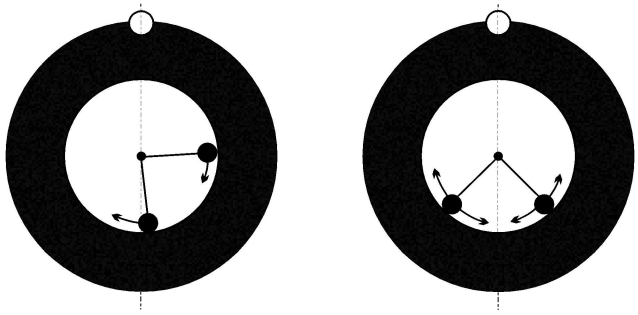
Intrinsic Imbalance = e (**Wheel Mass**)

Measured Imbalance = r (**Balance Weight Mass**)

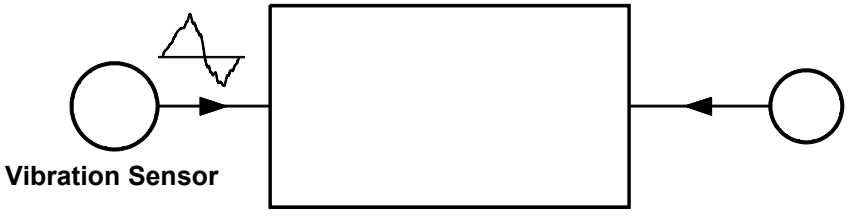


The imbalance of a grinding wheel is determined in practice by use of the Measured Imbalance of the wheel. The Measured Imbalance is equal to the product of the mass of an attached balance weight, located to balance the grinding wheel, multiplied by "**r**" the distance between that weight's center of mass and the grinding wheel's center of rotation. In both cases, the imbalance is given in terms of a mass multiplied by a distance, with (grams)(centimeters) being the units used for reference by the system.

In order to correct for various and changing imbalances which occur on a user's grinding machine, the SBS Manual Balance Control uses two or three movable variable angle balance weights, which can be independently positioned. These weights are usually supplied by the grinder manufacturer and are typically located in grooves in the wheel flange or wheel hub.



The system consists of the SBS microprocessor based Control Unit, a Vibration Sensor, and an RPM sensor. Imbalance is expressed as spindle movement or vibration detected from the grinding machine by the sensor. The vibration signal from the sensor is transmitted to the control unit, which filters the signal by RPM. The control unit guides the user in manually positioning the grinder's balance weights, so that the amplitude of the incoming vibration signal is lowered to a user set level of acceptable balance.



Environmental Considerations

The SBS Manual Balancer is designed to dynamically correct for the detrimental effects of grinding wheel imbalance on quality of surface finish, part geometry, as well as wheel and machine bearing life. The system cannot correct for other environmental problems. This section is intended as a discussion of some common environmental problems which may influence grinding quality.

Other Sources of Vibration

A most common source of vibration is adjacent machinery. Grinding machines should be properly isolation mounted if vibration-producing machinery is operating nearby. Other sources of vibration may be components mounted on the machine, such as pumps, motors, drives, etc.

The SBS Manual Balancer may not operate efficiently under the influence of some external vibrations. The system filters the vibration signal it detects from the grinding machine at the frequency of the spindle RPM. This means that vibrations occurring at frequencies other than that of the rotating wheel will be ignored by the system. For adjacent machinery operating at the same frequency, or in phase with that frequency, the system will not distinguish between vibrations occurring from wheel imbalance and those originating in the adjacent machine.

An excellent test for environmental vibration is to monitor the vibration level on the grinding machine while the spindle is not turning. The vibration level should be checked in various locations on the grinding machine, but in particular at the location the vibration sensor is to be mounted. All surrounding equipment, including any auxiliary pumps or attachments on the grinding machine should be operating during this test. The SBS Manual Balancer can help perform this test *(see: Background Vibration section),* but cannot remove these vibrations.

Machine Condition

Grinding machine condition is an important factor in determining the minimum balance level that the SBS Manual Balancer can achieve. The spindle should be balanced, as well as all components in the spindle drive train (i.e. belts, pulleys, motor, etc.). The Manual Balancer can be used to readily determine if any significant imbalance exists in the machine itself. Simply use the same method as described above for checking environmental vibration, except test with the spindle running and with no wheel mounted. The SBS Manual Balancer cannot remove vibration resulting from machine condition problems.

System Installation

SBS Control Unit

The SBS Control Unit should be mounted in a location allowing observation of the display by the machine operator. A variety of mounting hardware is available for installation on horizontal surfaces or for rack mounting. Cabling connections to the control unit include the Vibration Sensor and RPM Sensor, the power cord, and the selected machine controller interface cable *(see: System Connection diagram)*.

Vibration Sensor Location

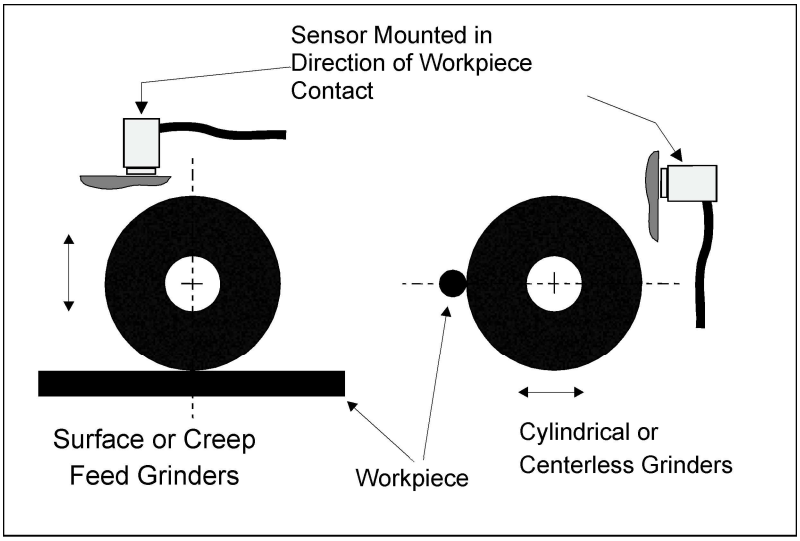
The Vibration Sensor can be mounted on the grinding machine using the magnetic mount provided, or permanent stud mount. The magnetic mount should be used during initial system start up until a good permanent location is found on the grinding machine for the sensor. The sensor can then be permanently stud mounted at that location. A machined flat should be supplied at the mounting location when stud mounting the sensor.

The location and installation of the sensor are critical for successful operation of the SBS Manual Balancer. Because of differing machine characteristics, Vibration Sensor location is specific to the machine model.

There are two general principles that should assist in finding a proper sensor location for your grinding machine.

1. **Locate the Sensor in the same direction as the centerline between the grinding wheel and the workpiece**. The best place to start is a flat machined surface on the spindle housing over the bearing closest to the wheel and perpendicular to the spindle's centerline. A vertical mounting surface is preferable on most cylindrical grinding machines because the sensor is in line with the grinding wheel and the workpiece. For this same reason on surface grinders and creep feed grinders, a horizontal mounting surface is generally best. Although the balancer itself may be mounted either on the wheel or pulley end of the machine, the Sensor should always be aligned at the wheel end of the machine.

2. **Locate the sensor on a rigid part of the machine structure, where vibration from the spindle will be accurately transmitted.** On some machines the wheel guard can be a good location to mount the sensor, if it is heavy enough and rigidly attached to the spindle housing. The Manual Balancer relies on vibration signals received from the Vibration Sensor to accurately display the current vibration level in peak-to-peak units, and to balance the grinding wheel. The system employs narrow bandwidth filters that prevent vibration at non-spindle frequencies from being detected. However, in applications where the motor or other machine components are running at the same speed or frequency as the spindle, interfering vibrations may result. Careful experimentation with the sensor's location minimizes sources of interference.



RPM Sensor Installation

The RPM sensor is an inductive proximity sensor. The RPM Sensor must be located in position to detect a one per revolution hole or protrusion in the spindle or attached rotating parts such as pulley, wheel hub, etc. A simple hole drilled in a face or OD is often the simplest method of providing such a feature. The Sensor should be mounted using the supplied mount bracket, and positioned so that the face of the sensor is about 1mm from the high surface, and placed so that the hole or protrusion will pass directly under the sensor. The RPM SENSOR alignment feature under MENU will assist in verifying proper position. CAUTION – Once the sensor is positioned, clamp the mount bracket tightly to the sensor body to lock it in place, and prevent movement under vibration which might allow the sensor to contact the rotating surface.

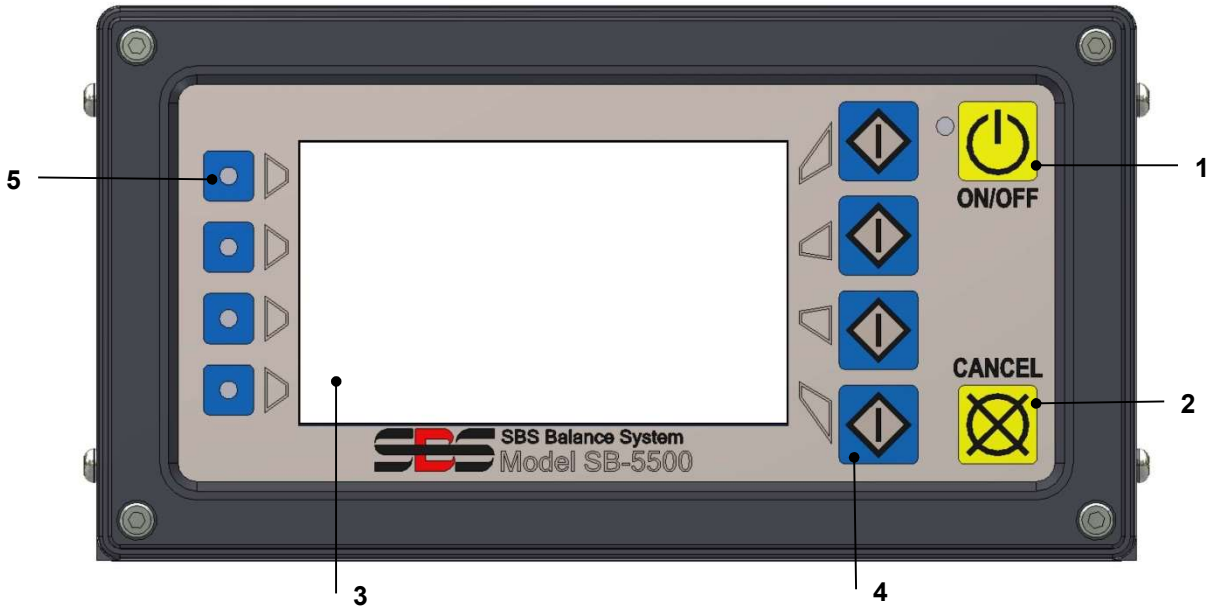
Control Unit Operating Instructions

The following is an overview of the control and interface features of the SBS SB-5500 Control Unit.

IVIS Software Interface

The standard unit is delivered with an LCD display panel and keypad. This manual describes the hardware panel user interface for this product. IVIS Software from SBS can also be used as the user interface on some machine CNC systems. All the basic concepts, data presentation, and parameter settings described are also presented in the IVIS interface but organized visually with some differences. Read the IVIS Operations manual in conjunction with this product manual when using the IVIS user interface.

Front Panel Controls



The above figure illustrates the controls and indicators on the front panel of the Balance Control Unit. The following is a description of these features:

1) ON/OFF. This button turns on the operating power for the system. When the system is turned on the unit initiates a Power-On Display, and the green LED to the left of the button will be illuminated. When turned OFF the unit is in the stand-by mode, and the green LED is blinking. This indicates power is connected to the unit, but the control is inactive.

2) CANCEL BUTTON. Pressing this button will cancel the operation in progress, or the last selection or entry made. Also clears any displayed error message.

3) LCD DISPLAY. **The display is not a touch screen. Do not press on the display screen**. The screen is used to display data and assign functions to the function buttons.

4) FUNCTION BUTTONS. Operation of the Control unit is accomplished via the four function buttons to the right of the display. The menu bar area of the display, to the left of these buttons, assigns the current function to each button. Use these buttons to make all operational selections.

5) SLOT STATUS LED. A three color LED on the left side of the display shows the operational status of the balancer card or other device cards installed in each of the four corresponding card slots.

Power-On Display

The Front Panel of the control can be removed and remotely mounted using a SB-43xx series cable. When switched on in either configuration the Control Unit performs self-analysis which defines its status, and the setting of operating parameters. Operator information is then shown on the LCD display following the startup sequence described below:

1) The company logo screen is displayed and lights on the front panel are illuminated to verify their operation. During this short time, the SETUP button is available. Pressing this button will enter setup mode for the control.

2) After four seconds, the unit displays information about each balancer or device card installed, indicating type of device and identifying information. To extend the time that this information is displayed, press any one of the function buttons while the slot information is on the screen. Each button press will add six seconds to the display time, giving additional time to read the information.

3) After two more seconds, the unit displays the initial operational screen for the control unit. The unit will display either the SHOW ALL monitor screen, or one card slot's main operating screen, whichever was selected when the unit was last switched off.

4) Any error conditions detected by the self-analysis are displayed as "ERROR - *code*" where *code* lists the reference code of the error detected. For detailed description of error codes, see the "Displayed Error Messages" section of this manual, or additional product instruction addendum manuals.

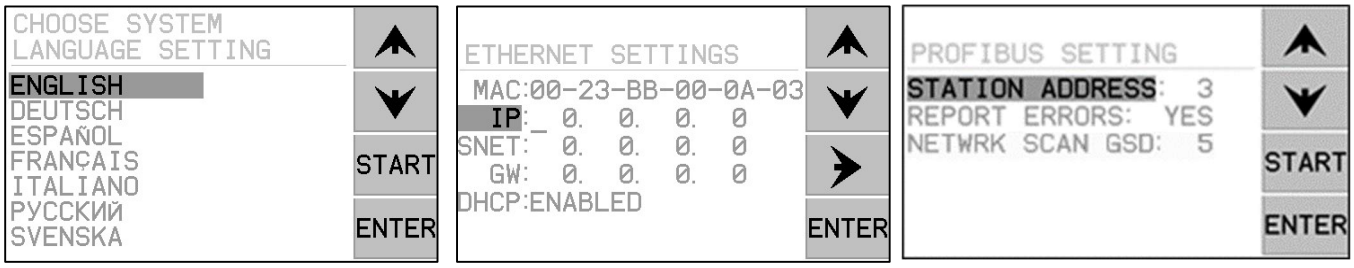
SETUP

At Power-on, press the SETUP button to enter this mode. The Setup screens allow the user to select:

1. Operational language
2. Ethernet settings
3. Profibus Station ID (if installed)

While in Setup mode:

- Press ENTER to save current settings on the screen and/or proceed to the next Setup screen
- Press CANCEL to cancel unsaved settings on the screen and/or proceed to the next screen
- Press START to cancel unsaved settings, exit Setup mode, and start operation.



The first Setup screen selects the language used by the control. Use the arrow buttons to scroll through the available languages. The second Setup screen allows Ethernet settings. Manual settings can be made or DHCP can be enabled for automatic assignment. Use the arrow buttons to scroll through all the available Ethernet settings and use the up and down arrows to change digits.

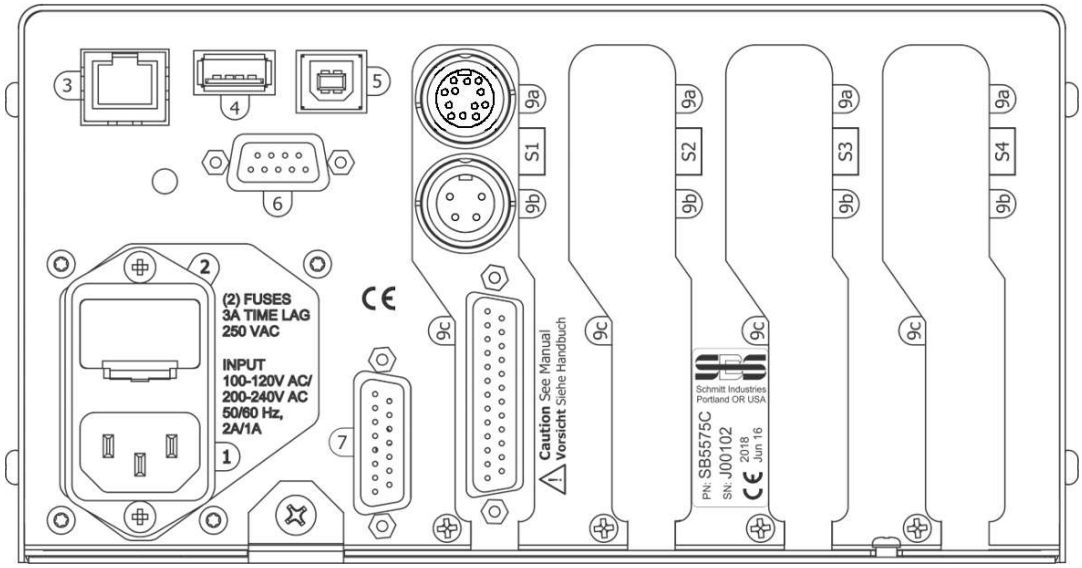
If Profibus is installed, the third screen allows selection of Station ID and other items. For more information see the Profibus manual available at **https://accretechsbs.com/**.

Control Unit without Front Panel Connected

The control unit can be operated without a user interface attached, providing the monitoring functions via the CNC, Profibus, and Software Interface. The user interface is only required for setting all parameters.

Rear Panel Connections

The figure following shows the rear of the control. The following connections are located on the rear panel of the Control Unit, and are common to any cards installed in the control.



1) POWER SUPPLY. Connection for line power input (AC input model shown)
Caution: Before applying power to the Control, make sure the supply voltage is within specified range.
AC Input Models: 100-120V AC, 200-240V AC, 50-60 Hz
DC Input Models: 21 VDC to 28 VDC. 5.5A max at 21 VDC.

2) FUSE HOLDER. Contains the line fuses. AC Input Controls use (2) 5x20 3A time lag, DC Input Controls use (1) 5x20 6.3A.

3) ETHERNET. Provides TCP/IP or UDP connection to host device, such as CNC Controller or IVIS.

4) USB CONTROLLER. Allows USB flash drive to be connected for Firmware update. Latest firmware for the control and update instructions are available on the SBS website.

5) USB DEVICE. Provides connection to another USB 2.0 host, such as a CNC Control.

6) PROFIBUS. Provides connection to Profibus DP host device, such as CNC Control (option).

7) REMOTE. This DB-15 connector receptacle is a duplicate of the connector on the font side of the box, used to connect the optional cable for remote front panel installation.

S1-S4 DEVICE SLOTS. Numbered Slots are available for installation of balancer cards or other device cards supplied by SBS. Unused Slots are covered with blank panels.

Balancer card rear panel connections

The control comes standard with one card, and others can be purchased and added to the control unit as required. Each card has three connections on the rear panel of the control.

9a) RPM CONNECTION. Connects to the RPM sensor. SB-5543 3-pin. SB-5544 12-pin.

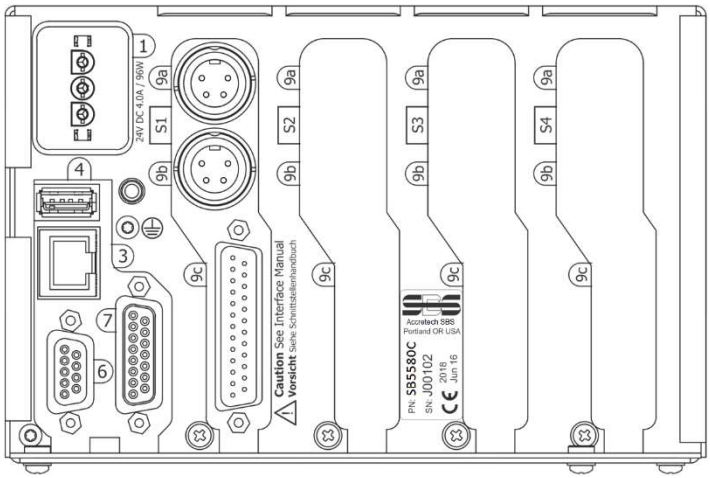
9b) SENSOR CONNECTION. Connects to the Vibration Sensor.

9c) HARDWIRE INTERFACE. Standard DB-25 connector for connecting the individual balancer card in the control to a grinding machine controller. A complete description of this interface is given in the "Hardwire Interface" section.

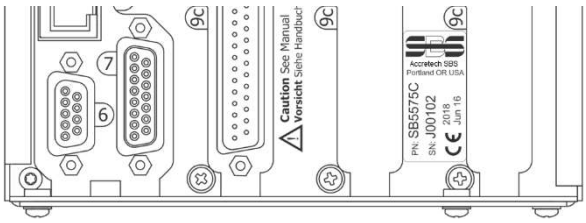
SB5580

The SB-5580 is a smaller chassis version of the SB-5500 control series, which has been designed for the space constraints of mounting inside the electrical cabinet of the grinding machine. It supports four device cards of the same series (S1-S4), and requires power input of 24 VDC, with the same specification as SB-5500. The panel connectors are the same and are labeled in the same way as SB-5500 above, except for the USB DEVICE connector which is located on the bottom of the control instead of the back panel.

A 3-slot version is available and both sizes are also available in a Profinet configuration. For the Profinet, connection 3 is maintained for the standard Ethernet communications and connection 6 is changed to an Ethernet connector for the Profinet communication. See the Profibus manual.



SB-5580 – 4 slots

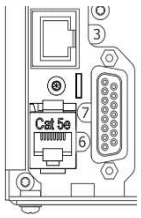


SB-5575 – 3 slot version

Profinet configurations:

SB-5576 – 3 slots

SB-5581 – 4 slots



MENU Settings

Note: All menu items are set independently for each installed balancer card, or other device.

Press the MENU button to display the menu items detailed below. The menu provides access to system settings for individual balancer cards, and to perform certain optional functions. Use the up and down arrows buttons to move through the menu items. Press ENTER to access the selected menu item. Press EXIT or CANCEL to exit the Menu and return to the Main Screen for the card.

Balance Settings

Use the backward arrow button to move the cursor from one digit to the next. Use the up and down arrow buttons to increase or decrease the value of the selected digit. Press the ENTER button to save any changes and move to the next balance setting. Pressing CANCEL will return to the Menu. Each of the following balance settings are presented consecutively.

1. **LIMIT** target level. The level that the user will try to achieve during a Balance cycle, which is provided as a reference for the user only. The Balance system will always perform a "best possible balance", and results will depend on accuracy of weight location during the entire balance cycle. This value should be set at least 0.2 micros higher than the background vibration level.
2. **TOLERANCE** level. This level sets the high end of the acceptable balance range. When this level is exceeded a Balance out of Tolerance (BOT) error condition is reported. This error signals the operator or machine controller to re-balance the machine. This level needs to be determined by process considerations. It should rarely be less than 1 micron above the Limit.
3. **CRITICAL** level. This level can be set at a value providing a secondary warning of extreme out of balance condition that may be damaging to the grinding machine or process. When this level is exceeded a Critical Balance out of Tolerance (BOT2) error is reported. This signals the operator or machine controller to shut down the machine. This same error can also be triggered by excessive RPM *(see: Critical RPM)*.

Vibration Units

Press the corresponding button to select from the available vibration units, available in displacement or velocity, as well as english or metric units. The currently selected units are highlighted on the screen. Once selected, the display changes allowing the up and down arrows to be used to set the resolution. Press ENTER to save the selection. Changing vibration units between metric and english will convert the numerical value set for the Limit, Tolerance, or Critical Levels. **Caution -** Changing between displacement and velocity units will not change these numerical values, as no direct conversion is possible. In this case the user must review and edit the limit settings to an appropriate number.

Plot Vibration

This function allows the user to perform a vibration spectrum sweep in a selected RPM range. The operation takes 10-20 seconds. It generates an on-screen graphical representation of the amplitude of vibration monitored at each RPM range in the form of a bar graph. It also produces a text listing of the top twenty vibration peaks encountered during the spectrum sweep. See the "Plot Vibration" section for operational details.

Card Name

A user selectable name or label is used on screen to identify each balancer card. When no name is assigned by the user, SLOT# is default name assigned for screen display, where "#" is the number (1-4) of the slot where the card is installed.

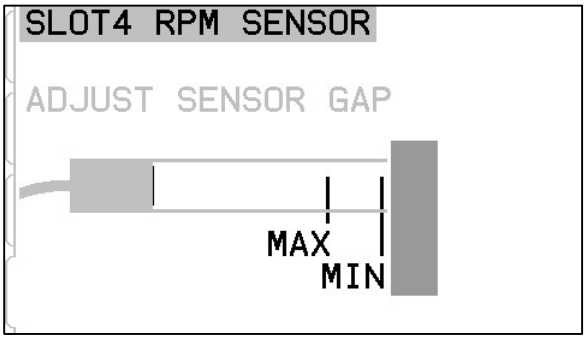
Menu Entry

This selection disables access to the menu via the front panel unless a standard security code is entered. This ensures that system settings will not be accidentally compromised. The screen displays "ENABLED" when

Menu access is unlocked, and "PROTECTED" when menu access is controlled by the access code. The standard access code is **232123.** Once the code is entered and the ENTER button pressed, the MENU selection is protected. Access to the menu will now require entry of this code. The message MENU ACCESS PROTECTED will be displayed notifying the user that the menu is password protected, and the user will be given the opportunity to enter the code. Entering an incorrect code will produce the message INCORRECT CODE ENTERED TRY AGAIN/ CANCEL.

To disable menu protection, select MENU ENTRY, and enter the same code to turn off protection. The display for MENU ENTRY will display ENABLED when protection has been disabled.

RPM Sensor



The speed sensor must be correctly positioned opposite to and in line with a rotating trigger feature on the machine. After installation of all system components, switch on the SBS control. With the spindle stopped, loosen the mounting bolts and shift the speed sensor, so that it touches the metal of the mating face on the part that normally rotates (e.g. spindle, wheel holder, etc). Pull the speed sensor back to the specified gap of 1 to 3 mm. The system should have recognized and calibrated the speed sensor. If this is not the case, chose "RPM SENSOR" from the MENU. A graphic appears as shown depicting the gap between speed sensor and facing surface. Position the speed sensor so that the graphic shows the correct distance.

Factory Settings

Returns user selectable parameters under the BALANCE SETTINGS menu to the default factory defaults, changes BALANCE SPEED to CAUTIOUS, and sets CRITICAL RPM back to 0.

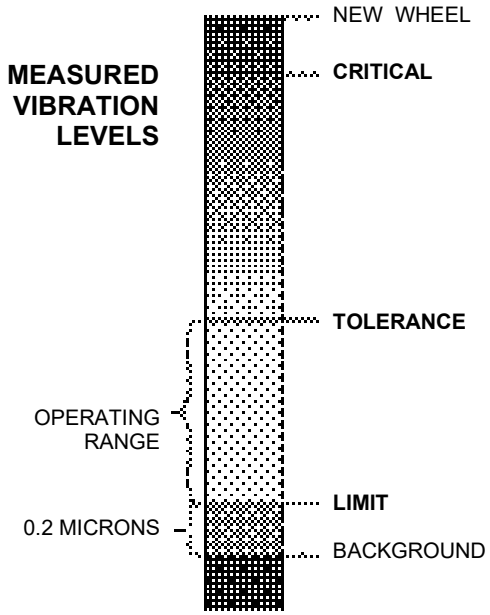
Critical RPM

These two screens allow the user to set both a Max. RPM limit and a Min. RPM limit. If machine RPM rises above the Max. limit or falls below the Min. limit, the Balance Control will indicate an error condition as described below.

1) The SLOT STATUS LED will illuminate **RED** if the Max. RPM limit is exceeded.
2) Both the BOT and BOT2 outputs will be active if the Max. RPM limit is exceeded.
3) BOT2 will be active and BOT inactive if the machine RPM falls below the Min. RPM limit.
4) Main Operating Screen will indicate out of limit RPM icons, ⓘ+ or ⓘ−.

These limits are both alternate causes of the BOT2 output being active *(see Balance Critical)*. The BOT2 output can be monitored by the machine controller, and if desired can be used to set off additional warnings or interrupt the operation of the grinding machine. To set either limit, use the left arrow button to select digits, and the up and down arrow buttons to change the selected digit. Press ENTER to save the setting and return to other screens. To disable either Critical RPM limit, simply reduce the limit setting to zero.

Setting Operating Parameters



This section details the menu selected operating parameters of the control. For control units with more than one balancer card installed, the user should select the desired card and then enter the MENU.

The operating parameters are independently set for each card.

Balance LIMIT

The SBS Manual Balancer is designed to balance quickly to a calculated "best balance" point. The Limit is used only as a benchmark by the user to determine if balance cycles performed achieve a predetermined target result. The Balance system will always perform a "best possible balance", and results will depend on accuracy of weight location during the entire balance cycle. The Balance Limit is factory set at 0.4 microns of displacement. A balance level of 1 micron or less is generally considered adequate for most applications. **The lower the balance Limit is set, the more likely it is that environmental noise and slight errors in weight placement will prevent the Limit from being reached.**

NO BALANCE SYSTEM IS CAPABLE OF BALANCING THE GRINDING WHEEL TO A VALUE BELOW THE BACKGROUND LEVEL. Trying to set the balance Limit below background levels will result in long or failed balance cycles. Since the background vibration level is often a product of floor transmitted vibrations, these levels may change as adjacent machines are put into or out of service. **Set the balance Limit during periods when the system will receive the maximum floor transmitted vibration**.

To set the Limit, select BALANCE SETTINGS from the menu. The Limit is set using the arrow buttons, followed by pressing ENTER. **Note:** Velocity units may be selected for monitoring machine vibration; however the Limit setting can only be made in units of displacement.

Balance TOLERANCE

This operator defined setting establishes an upper-limit for normal process vibration for the system. When reached, this setting will indicate the need to rebalance. Indications given on the front panel for balance status are shown in the following table, and additional indication is given via. both the Hardwire and Software Interfaces. The Tolerance level must be set **at least** 0.2 microns above the LIMIT setting. Typically it is set at least 1 micron above LIMIT setting.

Vibration Level	Slot Status LED	Bar Graph	Status Message
Below TOLERANCE	Green	Green	BALANCED
Above TOLERANCE	Yellow	Yellow	NEEDS BALANCE
Above CRITICAL	Red	Red	CRITICAL

Balance CRITICAL

This operator defined setting establishes an operational upper safety limit of vibration for the system. When reached, this setting will cause and indication of the critical need to perform a re-balance operation. This indication on the front panel is shown in the above table, and additional indication is given via. both the Hardwire and Software Interfaces. The Critical level must be set **at least** 2.0 microns above the TOLERANCE setting.

Vibration Display

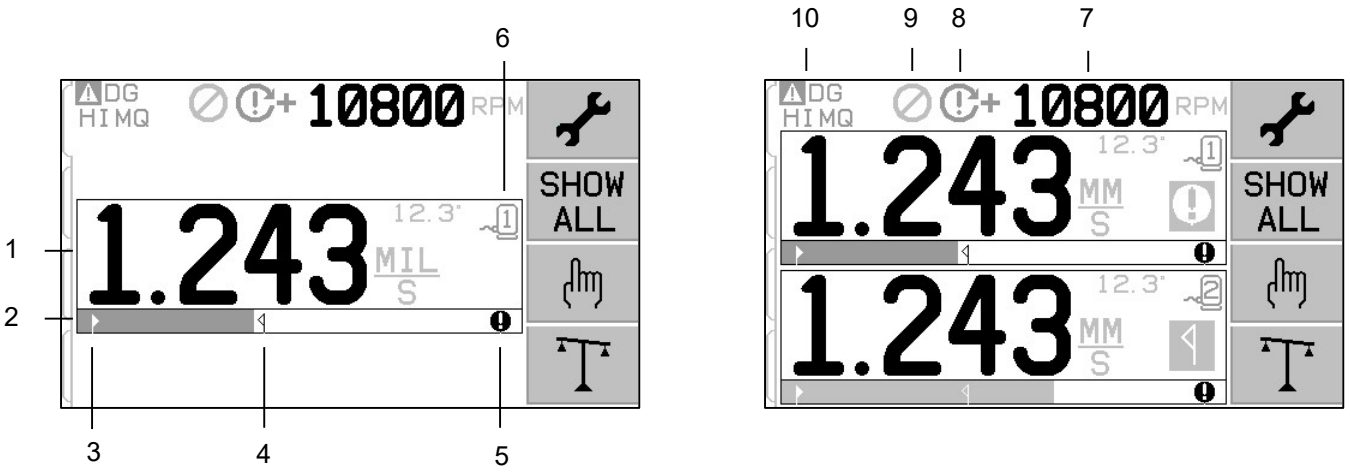
The units used by the Control Unit to display machine vibration levels are selectable between metric or English units. The Control Unit can also display vibration in terms of velocity or displacement. The factory setting of displacement most directly reflects the movement of the grinding wheel and therefore impact of vibration on the work piece. Use the VIBRATION UNITS Menu item to select the desired option.

Balancing

Prepare for balance cycle

A balance cycle is an iterative or repetitive process of manually positioning the grinder's balance weights according to the system's directions, and then checking the results of each move. **Important** – successful balance cycles depend on careful and accurate placement of balance weights at the locations specified by the balancer. The user must provide the following markings on the grinder in order to allow for successful balancing:

1. Before balancing can be performed, the machine must be fitted to allow the user to manually position balancing weights on the machine conveniently. This can be accomplished in any of the methods described under the "Balance Type" setting description.
2. Each of the balance weights should be marked with a center line (center of mass) indication. This centerline is to be used to position each balance weight against the angle scale on the machine. Fixed mass weights to be used should be labeled 1, 2, 3, etc. to identify them individually.
3. An accurate angle scale must exist on the grinder which references the position of the balance weights. The scale accuracy and resolution will determine how accurately the balance weights can be placed, which will determine how well the machine can be balanced. SBS can provide angle scales for users which lack one. Contact your SBS representative for details.



This is the balance screen. The first screen shows the display in single plane balance mode, and the second shows the display in 2-plane balance mode. The first group of screen elements shown are specific to a single balance plane and are duplicated in the 2-plane view.

Balance screen elements for single balance plane

1. Vibration level indication. Vibration values will not display if there is a vibration sensor error (missing or shorted), or if there is no RPM value displayed. To the right of the vibration display, two Balance conditions will be indicated when they occur:
   a. ◥ - Tolerance Level exceeded (yellow color). The symbol will flash in yellow if the vibration level rises over the user selected Balance Tolerance limit.

b. - Critical Balance exceeded (yellow color). The symbol will flash in yellow if the vibration level rises over the user selected Critical Balance level.

2. Vibration bar graph. Shows the current vibration level graphically. The scale is linear between the current settings for Balance Limit and Balance Tolerance. A different linear scale applies between the Balance Tolerance level and the Critical Balance level.
3. Balance Limit. This fixed position on the graph indicates the current level set for the Balance Limit, relative to the measured vibration level.
4. Balance Tolerance. This fixed position on the graph indicates the current level set for the Balance Tolerance, relative to the measured vibration level.
5. Critical Balance Level. This fixed position on the graph indicates the current level set for the Critical Balance, relative to the measured vibration level.
6. Slot Number. Identifies the balancer plane using the card slot number (1-4) in the SB-5500. Note: for dual plane operation slots 1 and 2 must be paired, or slots 3 and 4 must be paired. The currently selected and active slot shows the sensor symbol with slot number displayed in green color. To select an alternate balance plane (slot number), use the Show All screen.

Balance screen elements common to 2 planes

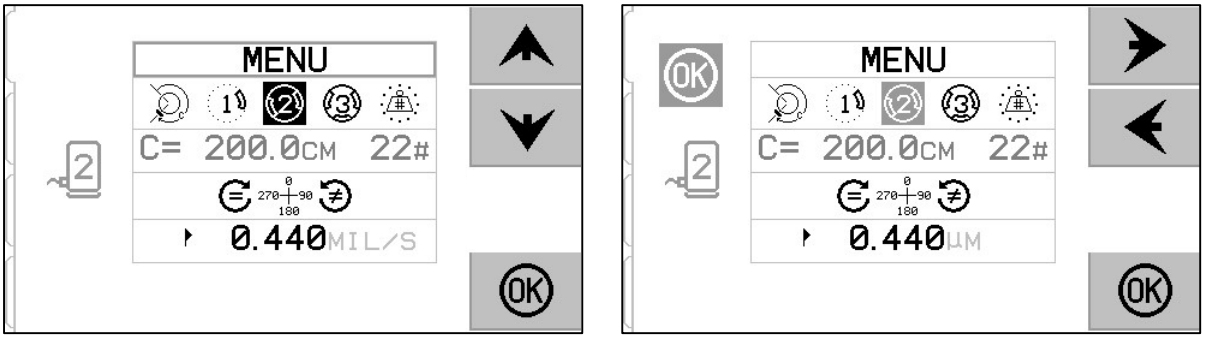
7. RPM indication. RPM values will not display if there is no incoming signal (spindle is stopped, or RPM sensor is missing or shorted). A manual RPM value can be set if needed (see Manual RPM Setup)
8. RPM Error indication. Displays one of following icons to indicate RPM error conditions:
   a. - (red color) Critical RPM exceeded. The symbol will display and flash if the RPM level is over the Critical RPM user setting.
   b. - (red color) RPM Minimum not met. The Symbol will display and flash if the RPM level is below the Minimum RPM user setting.
   c. - (yellow color) No RPM signal from sensor is present.
   d. - (yellow color) RPM above operation limit. The symbol will display and flash when the RPM detected is above the maximum operational limit of 30,000 RPM.
   e. - (yellow color) RPM below operation limit. The symbol will display and flash when the RPM detected is below the minimum operational limit of 300 RPM.
9. - Front Panel Inhibit (FPI) is active (see FPI under hardwire interface).
10. - This symbol shows an existing error condition (see Error conditions), and is displayed with the letter code of the corresponding error(s).

Edit and navigation conventions

The following shows the conventions in operation throughout the menus.

- A yellow outline is used to indicate which option is currently selected. Most settings are represented by symbols that indicate the available options for that setting. Some settings require a number to be set.
- Current saved settings are shown as either a symbol highlighted with a white background, or by the displayed number for the setting.
- Use the arrow keys to move from one setting to the next. The yellow outline will indicate the current selection.
- Press the OK button to activate the selected option. Press Cancel to exit.

When in edit mode:



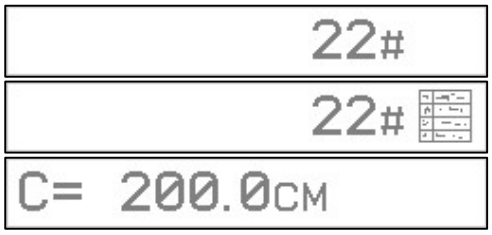
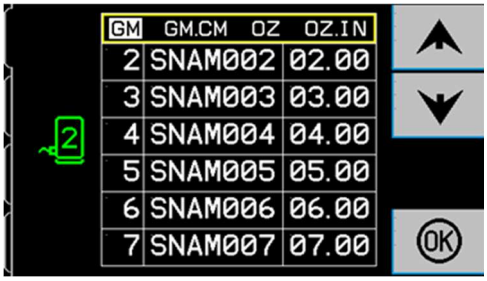
- A yellow highlighted background is used to show the current item or number being edited.
- The OK symbol will flash in yellow at the left side of the screen whenever the current selection is different than saved settings. This indicates that pressing OK is required to save the new current settings. Press OK to save changes or press ⊠ Cancel to discard changes made and revert to the previous data.
- The Arrow buttons are used to make selections from available options, and also to make edit numbers. Where a number needs to be entered, the ⮜ button is used to select the digit to be changed (move the underline). The ⮝ ⮟ buttons increment or decrement the number at the underlined digit. Holding the arrow button will start an accelerating repetition of the button press.

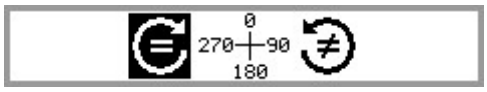
Balance setup – balance screen

There are a number of user selectable operating settings for the balance function, which are found under the button on the balance screen. Press the button on the balance screen to enter this menu. The Setup menu will time out after 1 minute of inactivity and the unit will return to the balance screen without saving any changes. The hardwire interface output relays remain active during setup.

Each of the following settings is presented in order under the setup menu.

MENU	Provides access to all the MENU settings for the selected balance plane.

	Balance Type. Each type describes the method of balancing weight attachment to be used on the machine to perform balancing. Circumferential Weight – One weight of variable mass is positioned at a distance around the circumference of a rotor. Single Weight – One weight of variable mass is positioned at an angle. Two Weights – Two equal, fixed mass weights are positioned at variable angle positions. Three Weights – Three equal, fixed mass weights are positioned at variable angle positions. Fixed Positions – A specified number of mounting positions in an equally spaced fixed pattern (such as a bolt circle) are available for adding variable mass weights. Table of Weights – User specified available weights (usually screws of different length and mass) are listed in a table, and these weights are then used to determine a best balance.
	If Fixed Position Balance Type is selected, then the right side of this selection is editable. This setting allows for editing the number of available fixed weight attachment positions (from 3 to 99). The positions are assumed to be evenly spaced in a 360 degree pattern. They must be labeled in order on the machine from 1 to the highest number available. If Table of Weights Balance Type is selected, then the table icon is also displayed. In this mode the number can be selected to edit the number of weight attachment positions, or the table icon can be selected to allow editing of the weight table. If Circumferential Weight Balance Type is selected, then the left side of this selection is editable. This allows for editing the circumference of the rotor on the machine, around which the user will measure the distance to place a balance weight.
	When edit of the table of weights is selected, a table of available weight values and corresponding user assigned weight ID names is presented. Press up/down arrows to select an item (select either units at top or a table value) to edit and press OK to edit the selected value. Edit of a table value is always followed by the edit of the corresponding ID name (even after pressing cancel). Press OK or Cancel to be exit the table edit mode. The weights are always sorted in the table by value. Duplicate value entries are deleted without prompt. Set a value to zero to delete the weight. Add a new value at the end of the list (the list is full at 15). Duplicate ID names are allowed.

	Scale Direction. This is a separate setting from Chamber Direction. It sets the direction of the scale used to position the balance weights relative to the wheel's direction of rotation. The weight scale direction is the direction in which the angle references (0°, 90°, 180° etc.) or the weight position location numbers (1,2,3,4, etc.) **increase**. **Spindle rotation is in the <u>same</u> direction as the weight scale.** **Spindle rotation is in the <u>opposite</u> direction as the weight scale.**
	Balance Limit. The low vibration level where the balance process is considered to be finished.

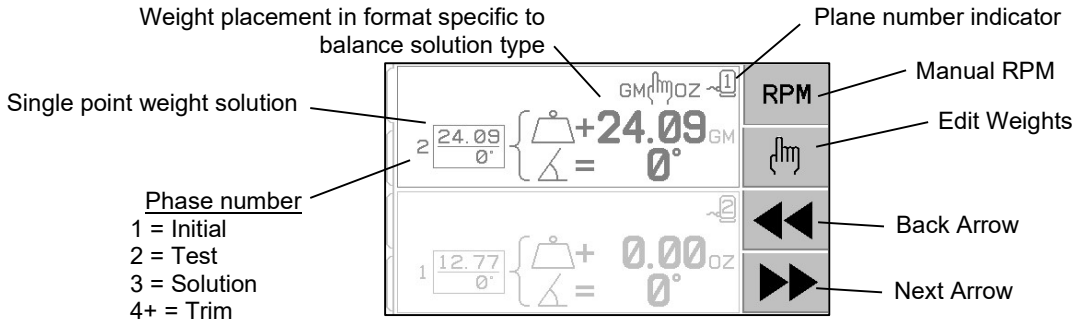
Balance process – balance screen

Press T from the balance screen to start a complete Balance operation. There are a minimum of three phases for each balancing cycle:

1. **Initial Phase**. The vibration level is measured and saved.
2. **Test Phase**. A test weight placed on the machine so its effect can be measured.
3. **Solution Phase**. The balancing solution is provided. The correction weight is placed on the machine & the results are measured.

If the resulting vibration is below the Balance Limit ▶ the balance process will complete and exit to the main screen. If the resulting vibration is above the Balance Limit, a new balance solution will be provided to correct for the residual unbalance. Every subsequent balance solution is a **Trim Phase**. A Trim phase is just an iteration of the Solution Phase, performed if more adjustment is needed.

Four parts of each balance phase:



a. Stop spindle. The control indicates that the spindle needs to stop.

b. Apply weights. Once stopped the operator must configure the weights as instructed.

c. Start Spindle. The spindle must be started.

d. Measure. The vibration can be measured for calculating the next phase.

This information is remembered through a power cycle. The hardwire interface output relays will remain active during the balance operation. Except where noted, the Cancel button will stop the balance operation and return to the main screen.

Trim balance – balance screen

Press the button from the balance screen to start a Trim Balance operation. This skips the Initial and Test phases of the operation and starts at the Solution phase. This option is available only if the SBS System has saved results from a previously completed Initial phase and Test phase.

The first two phases of the balance cycle (Initial and Test) allow the SBS System to determine and save essential information regarding the condition of the grinder and how changes in balance weights will effect machine balance. Assuming the conditions on the machine do not change (RPM, wheel size, etc.) then subsequent balance operations can be successfully performed without re-running these two phases. If machine conditions do change, then performing balance operations based on the saved results of the Initial and Test phases will produce inaccurate results.

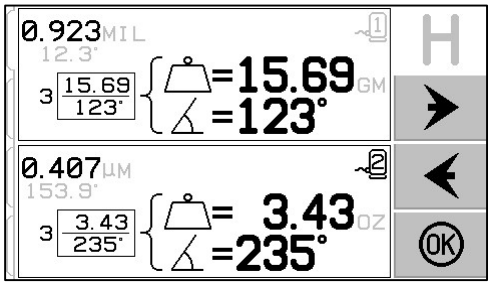
Trim balancing can be performed at any time that vibration levels rise above a satisfactory balance condition.

Balancing Problems - If successive Trim balance attempts are unsuccessful, this is an indication that either machine conditions have changed, or an error has occurred in weight placement (inaccurate position(s) or mass changes). In this case the operator should verify the Scale Direction setting is still accurate, then press to start a new complete Manual Balance operation.

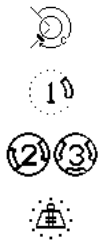
Important - Performing a Balance will only be successful if the user is very careful in following each step of the process, and making certain that weight movements and additions are performed accurately. Both the mass of weight used and the positioning of weights used will determine the accuracy of the balance achieved.

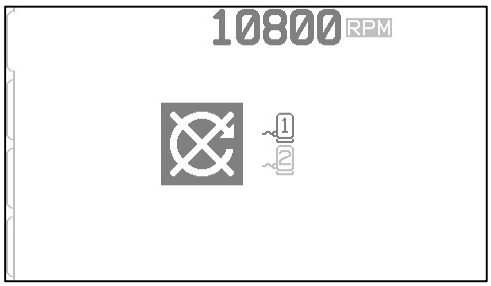
History screens

The History screens allow the user to view previously completed phases in the balance process, and even to perform again one of these previous steps. Press the key to access the history screens. When viewing the history screens, a large "H" is displayed at the upper right. The use the and buttons to step backward or forward thru the balance phases (note the phase number display). The button will be displayed when it is possible to repeat the operation of a particular balance phase (any phase 3 or higher).



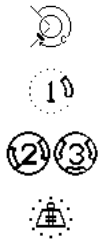
Balance Steps

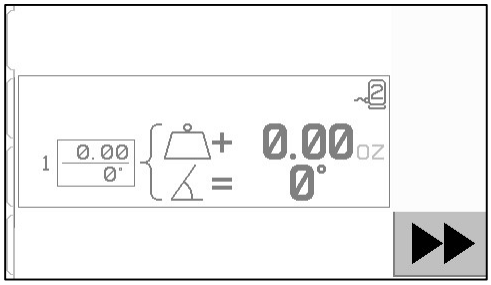




Initial

Stop Spindle - This screen requests the operator to stop the spindle. The Stop Spindle icon flashes as a reminder. This screen stays until the control detects that the spindle rotation has stopped.

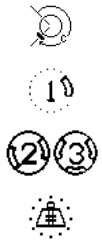


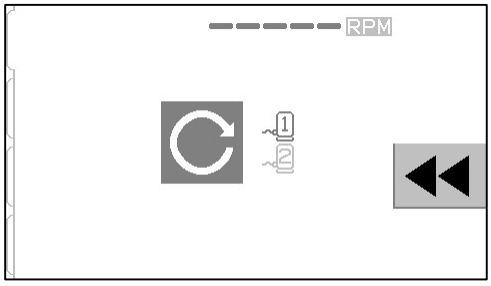


Initial

Apply Weights - Once the spindle is stopped, this screen shows the operator how to place the weight. During the Initial Phase there should be no weight placed on the machine, or 2 or 3 variable angle weights should be moved to null positions as directed.

Press ▶▶ to indicate that the machine is ready.

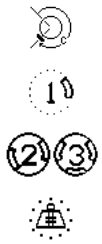


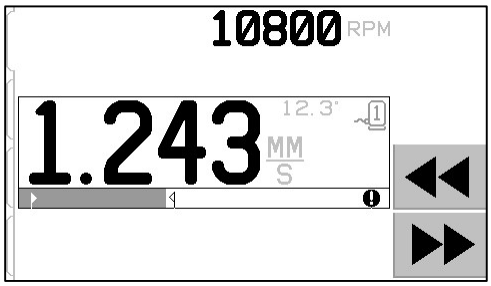


Initial

Start Spindle - This screen prompts you to start the spindle so a vibration measurement can be taken. The icon and the "RPM" both flash as a reminder. The control stays on this screen until it senses the spindle is up to constant speed. Then the screen advances to the Measure screen.

The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.

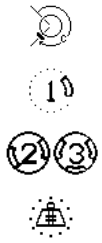


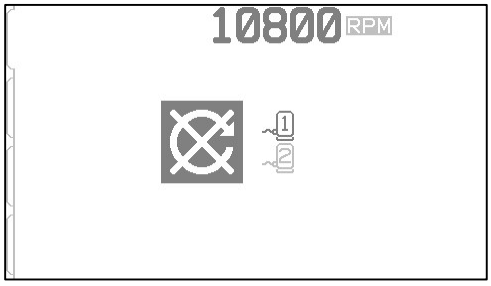


Initial

Measure Vibration - Once the rpm has stabilized, the Next arrow will appear on the screen and flash. Pressing ▶▶ will store this measurement into memory.

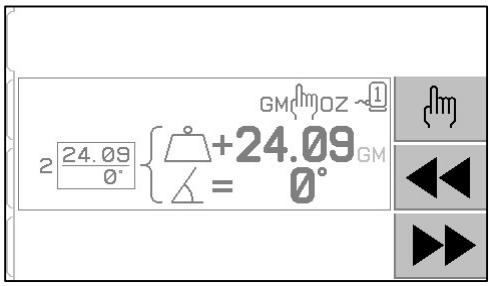
The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.





Test

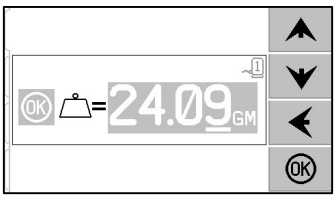
Stop Spindle - The Stop Spindle icon flashes as a reminder to stop the spindle.



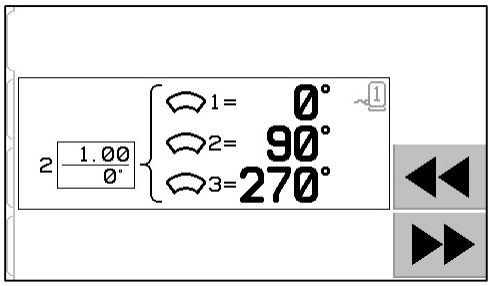
Test

Apply Weights - The test weight shown on the screen must be added at the zero position. The value of the test weight is shown.

During the Test Phase pressing the Edit Button (note g OZ icon) will display this screen, allowing the test weight mass value to be edited. The weight units can also be selected from g, oz, lb, kg, and none.



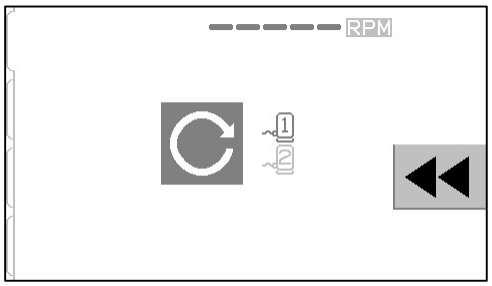
When done editing press OK to save changes and return to the Apply Weights screen.



Apply Weights - Once the spindle is stopped, this screen shows the operator where to position the weights. During this phase, one weight should be placed at the zero position **or** all weights moved to the positions shown.

Screens shown are for 3-weight balance, but the same process applies to 2-weight balance.

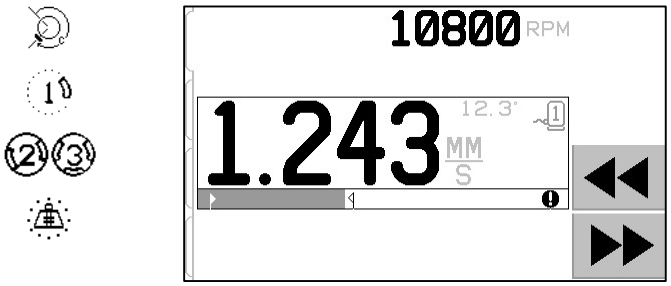
Press ▶▶ to indicate that the machine is ready.



Test

Start Spindle - The ↻ icon and the "RPM" both flash as a reminder to start the spindle again.

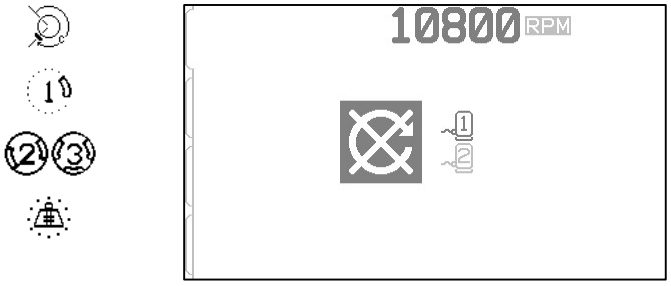
The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.



Test

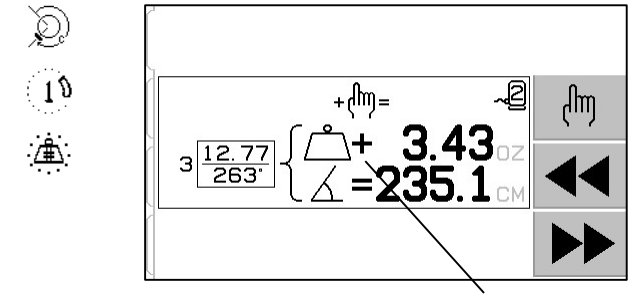
Measure Vibration - Once the rpm has stabilized, the next arrow will appear on the screen and flash. Pressing ▶▶ will store this measurement into memory.

The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.

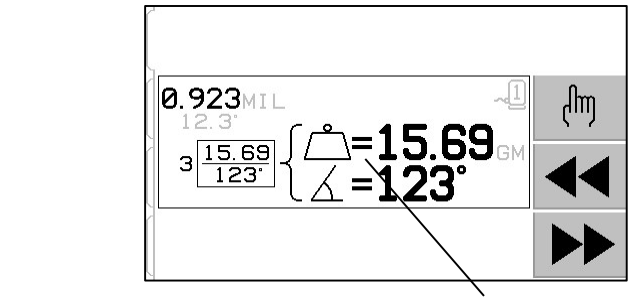


Solution

Stop Spindle - The Stop Spindle icon flashes as a reminder to stop the spindle.



Additive Weight Solution (+)



Absolute Weight Solution (=)

Solution

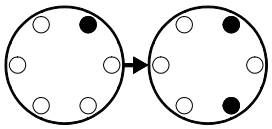
Apply Weights - The weight should be changed to the position and mass shown to bring the balance to a minimum.

Place balance weights on same radius as the test weight.

There are two ways to display the solution:

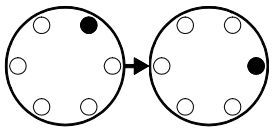
Additive Solution (+)

Leave all existing weights on the machine and only add what is shown.

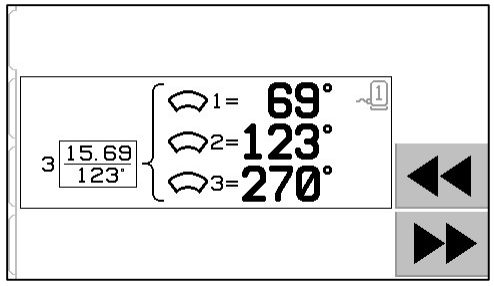


Absolute Solution (=)

Remove all test weights first then place weights as shown.

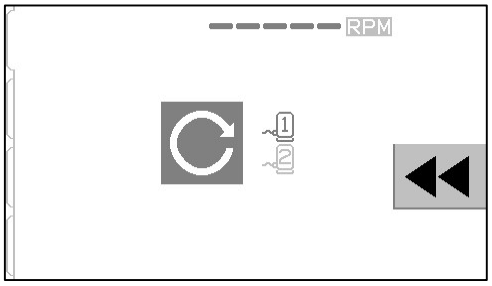


Press to Toggle between Additive and Absolute Weight Solution screens. (note + = icon on solution screen).



(2)(3) Apply Weights - The weight should be changed to the positions shown to bring the balance to a minimum.

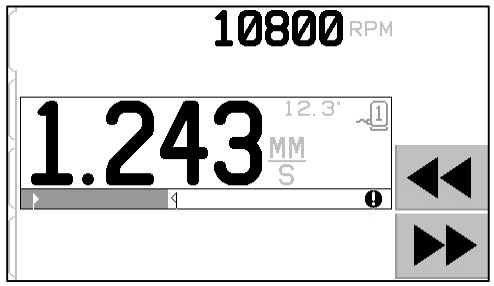
Press the next button ▶▶ to indicate that the machine is ready.



Solution

Start Spindle - The ↻ icon and the "RPM" both flash as a reminder to start the spindle again.

The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.



Solution

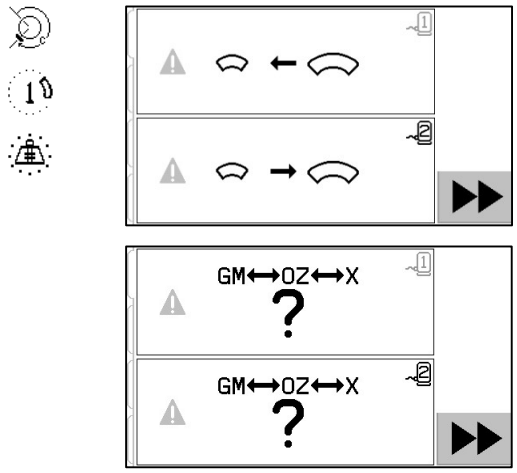
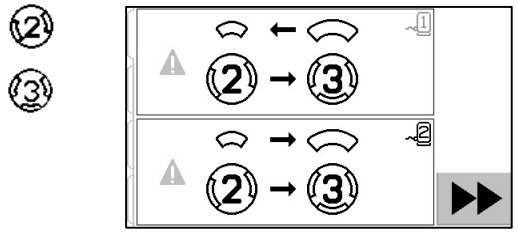
Measure Vibration. Once the rpm has stabilized, the right arrow will appear on the screen and flash. Pressing the next button ▶▶ will store this measurement into memory.

The Back arrow on the screen indicates that pressing ◀◀ will access the history screens.

If the resulting vibration is below the Balance Limit ▶ the balance process will complete and exit to the main screen. If the resulting vibration is above the Balance Limit, a new balance solution will be provided to correct for the residual unbalance.

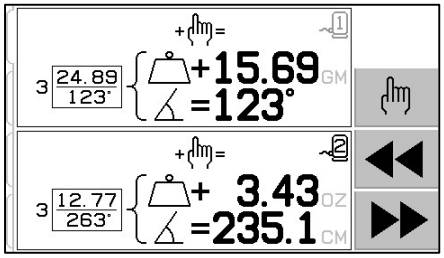
Every subsequent balance solution is a **Trim Balance**. A Trim balance is just another iteration of the Solution Phase, performed if more adjustment is needed. If changes are made, a new complete balance operation should be run by pressing T.

One of the following screens may be displayed instead of the Solution screen if the Balance Solution is difficult to achieve.

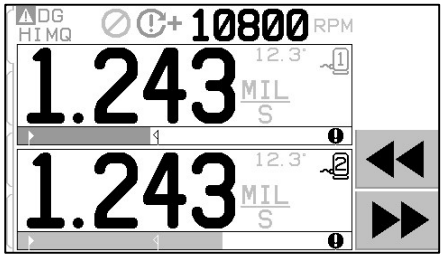
	The top screen shown indicates that either smaller or larger weights should be used. Press ◀◀ button to return to history screens for an opportunity to use a larger weight and repeat the Test phase. The bottom shown screen indicates that the compensation numbers are very large or small for accurate display and the weight units in use may need to change. Press ▶▶ button to return to the Apply Weights screen without making any changes.
	The images depict suggestions to improve results by increasing or decreasing the weight and/or changing the balance type between two and three weights. Press ▶▶ button to return to the Apply Weights screen without making any changes.

Balance steps for dual plane

For simplicity, the balance steps above are shown for single plane balancing. The steps for two-plane balancing are identical, but weight placement screens and measure vibration screens will show information for each of the two planes, with the top of the screen indicating one plane and the bottom of the screen indicating the second plane.

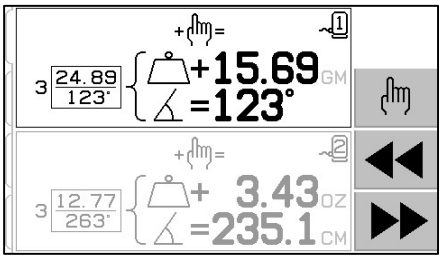


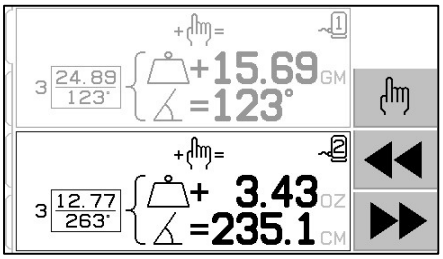
Weight placement



Measure Vibration

The test weight placement phase is broken into two separate steps, with one weight placement for each plane. The screen will show one plane as active, with the other plane shown greyed out. Complete each of the weight placements in sequence as directed.





Plot Vibration

This function performs an automated vibration spectrum sweep at specified RPM (frequency) ranges and displays the results graphically on screen. It can be useful in diagnosing machine condition induced vibration or discovering environmental problems, which may have adverse effects on the grinding process. The RPM range to be evaluated will vary by machine and process. The minimum and maximum operating RPM of the grinder should be determined. The suggested evaluation range is from 0.4 x (minimum RPM) to 2.0 x (maximum RPM). This includes all frequencies which will have potential harmonic influences on the operating RPM range. Also a wide range can be used to indentify an area of interest, and then to gain more detailed information, a narrower plot performed on the RPM range of interest.

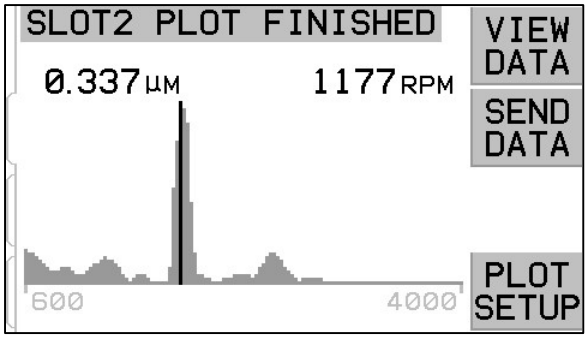
RPM RANGE – Select PLOT VIBRATION from the menu, then select RPM RANGE. The RPM Range is the frequency range that will be evaluated during the spectrum sweep. Use the arrow buttons to set the low end of the RPM range, press ENTER to store the value, and then enter the high end of the range in the same manner. When setting the RPM range use the up and down arrow buttons to increase or decrease values, and the left arrow button to move the cursor to the desired digit.

START – This begins the vibration sweep for the selected RPM Range. The rotating hour glass on the right hand side of the display indicates the Control is sweeping through the RPM range. During this process all recorded RPM, Vibration level pairs are sent out the software interface, in ASCII format. When the RPM sweep is complete, the display will show the resulting frequency plot. An un-cancelled plot will display full width on the screen. Cancelled plots will have fewer points and display in a narrower width. The vertical scale is linear, and based on the peak value, displayed at the top of the plot. The horizontal scale is logarithmic. The peak frequency will be displayed by a white line.

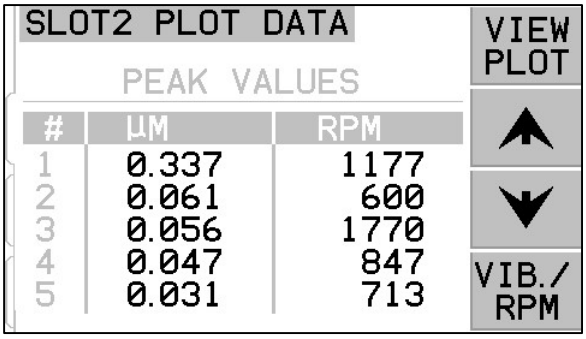
1) VIEW DATA. Press this button to change the display to a listing of peak vibration values. These are the top 20 (or less) values recorded in the selected range. The VIB./RPM button on this screen sorts the order of these values, allowing them to be ordered by vibration level or RPM. The arrow buttons are used to scroll up or down through the values. The VIEW PLOT button returns to the screen showing the last recorded graph.

2) SEND DATA. Press this button to export the recorded peak values, and corresponding RPM levels out the software interface, in ASCII format. This information can be captured and used as needed.

3) PLOT SETUP. This button returns the user to the setup screen for performing a vibration plot, where alternate RPM settings can be input for plotting, or the plot process can be exited, by pressing the EXIT button.



Frequency plot



Peak values display

Hardwire Interface

Interfacing the SBS Balance System with a CNC or PLC machine controller is supported via a hardwire interface or software interface. The hardwire interface is provided via a standard DB-25 connector located on the rear panel of each Balancer Card, while the Software interface is supported via either the USB or Ethernet connections, which are common to the whole control unit. Because of the many possible variations and configurations of cabling required for such an interface, it is left to the operator to supply the necessary cable.

When designing an interface for the SBS System, it is important to understand that the grinding machine's controller must operate the SBS System. It is not possible for the SBS System to control the grinding machine.

Carefully read this entire manual before attempting to interface the SBS System with any machine controller. Sections covering the interface of other SBS products installable in the SBS Control are covered separately in the manual addendum for such products.

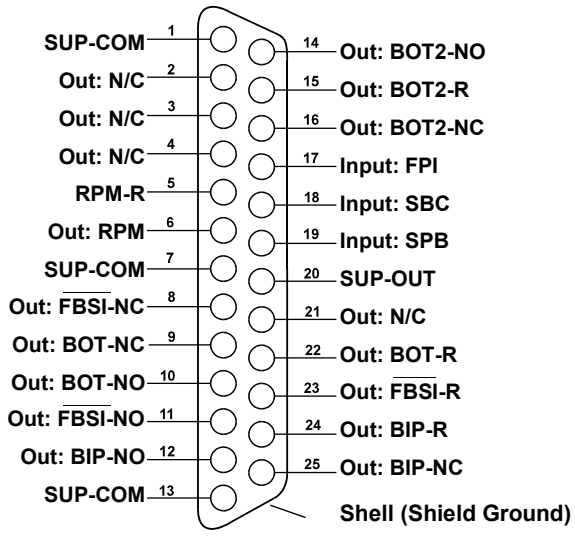
Hardwire interface overview

The hardwire interface consists of three sections: interface power supply, the inputs, and the outputs.

The interface power supply is provided exclusively for use with the hardwire interface inputs. It consists of three common pins and one output pin. The common pins are internally connected to chassis and earth ground. The output provides a maximum of 30 mA at approximately +15VDC. Any external power used for interface I/O must be from a SELV (Safety Extra Low Voltage) source or supply.

The three inputs provide noise immunity and robustness. The inputs are activated by being pulled high, either by connection to the SB-5500 hardwire interface power supply output or by connection to a customer supplied signal. Activating the inputs requires at least 8 mA at a voltage between 10 and 26 volts, AC or +DC, referenced to the SB-5500 hardwire interface power supply common. The common pins are internally connected to chassis and earth ground. The inputs are deactivated by removing the connection to the power or signal source.

SB5518 DB-25
Standard for SB-5500 balancers



The four outputs consist of optically isolated, solid state, single-pole/double-throw relays. These contacts may be used to supply an output signal by connection to a voltage source supplied by the customer. The contacts are electrically isolated from all other circuits and are rated for 24 Volts DC or AC, 50 mA maximum. Inductive loads must be protected against flyback to 50VDC.

The three contacts of a single-pole/b-throw relay are referred to as “normally open”, “normally closed” and “common”. The term “common” in this sense does not imply connection to power supply commons. The term “return” is used below to indicate the common contact of the relay.

Input Pin Names and Functions

Pin#	Name	Description
17	FPI	Front Panel Inhibit- When active, key operator actions at the front panel keypad are disallowed. The MENU, MAN., and the balance button are disabled. Still enabled are the Power button and the Cancel button, which can be used to stop a balance operation. Access to the SHOW-ALL button and System Status screen are allowed.

Output Pin Names and Functions

Pin#	Name	Description
22 10 9	**BOT-R,** **BOT-NO** **BOT-NC**	Balance Out of Tolerance: Return, normally open, and normally closed contacts. This output is active when 1) the measured vibration level exceeds the operator set vibration Tolerance, and remains active if the vibration exceeds the Critical Tolerance. 2) It is also active if the spindle RPM exceeds the operator defined Critical Max. RPM, but not active if spindle RPM falls below the user set Critical Min. RPM limit. Function of this relay during a balance cycle is determined by the CNC BOT MODE setting.
15 14 16	**BOT2-R** **BOT2-NO** **BOT2-NC**	Balance Out of Tolerance Two: Return, normally open, and normally closed contacts. This output is active 1) when the measured vibration level exceeds the operator defined Critical Tolerance, 2) when the spindle RPM exceeds the operator defined Critical Max. RPM, or 3) if spindle RPM falls below the Critical Min. RPM limit set. Function of this relay during a balance cycle is determined by the CNC BOT MODE setting.
24 12 25	**BIP-R** **BIP-NO** **BIP-NC**	Balance In Progress: Return, Normally Open, and Normally Closed contacts. This relay is energized while a balance operation is in progress.
23 11 8	**$\overline{\text{FBSI-R}}$** **$\overline{\text{FBSI-NO}}$** **$\overline{\text{FBSI-NC}}$**	Failed Balance/ System Inoperative: Return, normally open, and normally closed contacts. This output is active when the system is in normal operation mode, with the power on, and after a successful Power On Self-Test. It is de-energized if the control is in a power off or power standby mode, or if an error or fault condition arises.
6 5	**RPM** **RPM-R**	This solid state relay closes once per revolution. This is a buffered output of the RPM signal generated by the balancer. It is not available if the RPM has been entered manually.

Software Interface

The SBS Manual Balancer provides a software interface via either Ethernet TCP/IP or USB. The software interface allows the same control capability as the hardwire interface plus system status monitoring, setting the Low Balance Limit, and vibration spectrum analysis. The following description applies to all SB-5500 models.

Interfacing

The software interface provides a serial interface emulation which connects the Control to a Windows computer over either Ethernet TCP/IP or USB. For TCP/IP, use Telnet at the Windows command prompt pointed to the IP address of the Control, or use HyperTerminal or similar serial communications software pointed to port 23 with any baud rate setting. When connecting via USB, Windows will assign a COM port to the control. If the SB-5500 is not automatically assigned a COM port, a driver for Windows installation of USB-Serial communication is available on the SBS website at **https://accretechsbs.com/**. COM port assignment is controlled by Windows, and a unique COM port will be assigned for each detected SB-5500 control. The port assigned can be determined by viewing Windows Device Manager. Use HyperTerminal or other serial communications software to interact with the Control over USB connection.

Software Commands and Responses

When the Control unit is first powered up, the following message is transmitted via the software interface.

/SB-5500, Copyright (c) 2009, Accretech SBS, Inc.<CR>
V0.02<CR>

Commands - A message preceded with the digit '1' through '4' is a command or response referring to Slot Cards 1 to 4, respectively. A message starting with any other character refers to the System Control. Examples following use "1" as the card slot number.

The following commands from the Software Interface are available:

Control Unit Commands		
Command	Response	Meaning/ **Example**:
C	1)	Control Panel Status Inquiry. **<Esc>C<CR>**
	CI	Control Panel is Inhibited **CI<CR>**
	CE	Control Panel is Enabled **CE<CR>**
	CX	Control Panel is not installed **CX<CR>**
CE		Control Panel Enable. **<Esc>CE<CR>**
	K	Command Acknowledged **K<CR>**
	CX	Control Panel is not installed **CX<CR>**
CI		Control Panel Inhibit. **<Esc>CI<CR>**
	K	Command Acknowledged **K<CR>**
	Q	Command Not Accepted (Panel in use?) **Q<CR>**
	CX	Control Panel is not installed
V		Version Request (main board firmware). **<Esc>V<CR>**
	Vn.nn	Firmware Version **V1.00<CR>**

Slot Card Commands (Cards are Individually Controlled)		
Command	Response	Meaning/ **Example**:
X		Type (of slot card) Request. **< Esc >1X<CR>** Start Slot 1 Info Request.
	Xz.zzVn.nn [sss]/text	Slot response. z.zz indicates Slot Card type: 1.02 is Mechanical Balancer; 1.03 is N/C Balancer; 2.02 is Hydro Balancer; 3.00 is AEMS card; 5.00 is Manual Balancer. n.nn is balancer firmware revision. sss is the user specified name for this card. The slash precedes a text comment that explains the card type. **1X1.02V0.15[NAME]/MECHANICAL BALANCER<CR>** **1X1.03V0.15[NAME]/NON-CONTACT BALANCER<CR>** **1X2.02V0.15[NAME]/HYDROKOMPENSER<CR>** **1X3.00V0.03[NAME]/GAP / CRASH<CR>** **1X5.00V0.15[NAME]/MANUAL BALANCER<CR>**
	X0/No Card	No card is installed in the slot. **1X0/No Card<CR>**

Slot Card Commands (Cards are Individually Controlled)		
Command	Response	Meaning/ **Example**:
	XX/Not Responding	A card is installed in the slot, but is not responding to the system. **1XX/Not Responding<CR>**
G[sss][,[eee]]		Graph Vibration Spectrum. This takes vibration readings as a function of the rpm of the vibration. Optionally specify sss as starting rpm and eee as ending rpm. **<Esc>1G500,2000<CR>** Start Slot 1 Vibration Spectrum Program. Scan from 500 to 2000 RPM.
	U=units	Spectrum program started (units given) **1U=UM<CR>**
	Grrr,vv.vvv	Graphic Vibration Point. One line is generated for each RPM measured. rrr is the current rpm. vv.vvv is the measured vibration at the specified RPM. **1G500,0.04<CR>** **1G550,0.05<CR>**
	GE	Graphic Spectrum End. The graphics vibration spectrum routine is finished. **1GE<CR>**
GX		Cancel Vibration Spectrum. **<Esc>1GX<CR>** Stop Slot 1 Vibration Spectrum Program.
	GE	Graphic Spectrum End
L[x.xx[,[y.yy][,[z.zz]]]]		Limits Command. x.xx is Limit, y.yy is Tolerance, z.zz is Critical Vibration level, all in microns. If x.xx is not present then the Limit level will not be changed. If y.yy is not present then the Tolerance level will not be changed. If z.zz is not present then the Critical Vibration level will not be changed. **<Esc>1L<CR>** Get Slot 1 Balance Limits.
	Lx.xx,y.yy, z.zz	Balance limit response (new values). x.xx is Limit, y.yy is Tolerance, z.zz is Critical Vibration level, all in microns. **1L0.40,1.20,20.00<CR>** **<Esc>1L0.08,,15<CR>** Set Slot 1 Limit to .08, Critical level to 15.00, don't change Tolerance. **1L0.08,1.20,15.00<CR>**
R[rrr]		Set critical RPM level. rrr is new Critical RPM level. Values of 301-30100 are used as Critical RPM value. All other values are interpreted as OFF. **<Esc>1R3500<CR>** Set Slot 1 Critical RPM to 3500 RPM. **<Esc>1R0<CR>** Turn Slot 1 Critical RPM check Off. **<Esc>1R<CR>** Get Slot 1 Critical RPM
	Rrrr	**1R3500<CR>** Slot 1 Critical RPM is 3500 RPM. Response of rrr=300 means no limit is set, Critical RPM is OFF. **1R300<CR>**
S[C]		Status Request command. If 'C' present then previously reported errors condition will be cleared before the status is reported. **<Esc>1S<CR>** Report Slot 1 Status.
	S rrr,v.vv, [FBSI,] [BIP,][FPI,] ERR=eee	Status response. rrr is RPM, v.vv is vibration level in microns, FBSI indicates balance failed/system inoperative, BIP indicates balance in progress, FPI indicates front panel is inhibited. eee represent individual error letters representing error conditions. If the first letter is '@' then an error condition requires clearing (use SC command or press clear on front panel). **1S 1590,0.23,ERR=@GI<CR>** **<Esc>1SC<CR>** Report Slot 1 Status. **1S 1590,0.24,ERR=G<CR>**

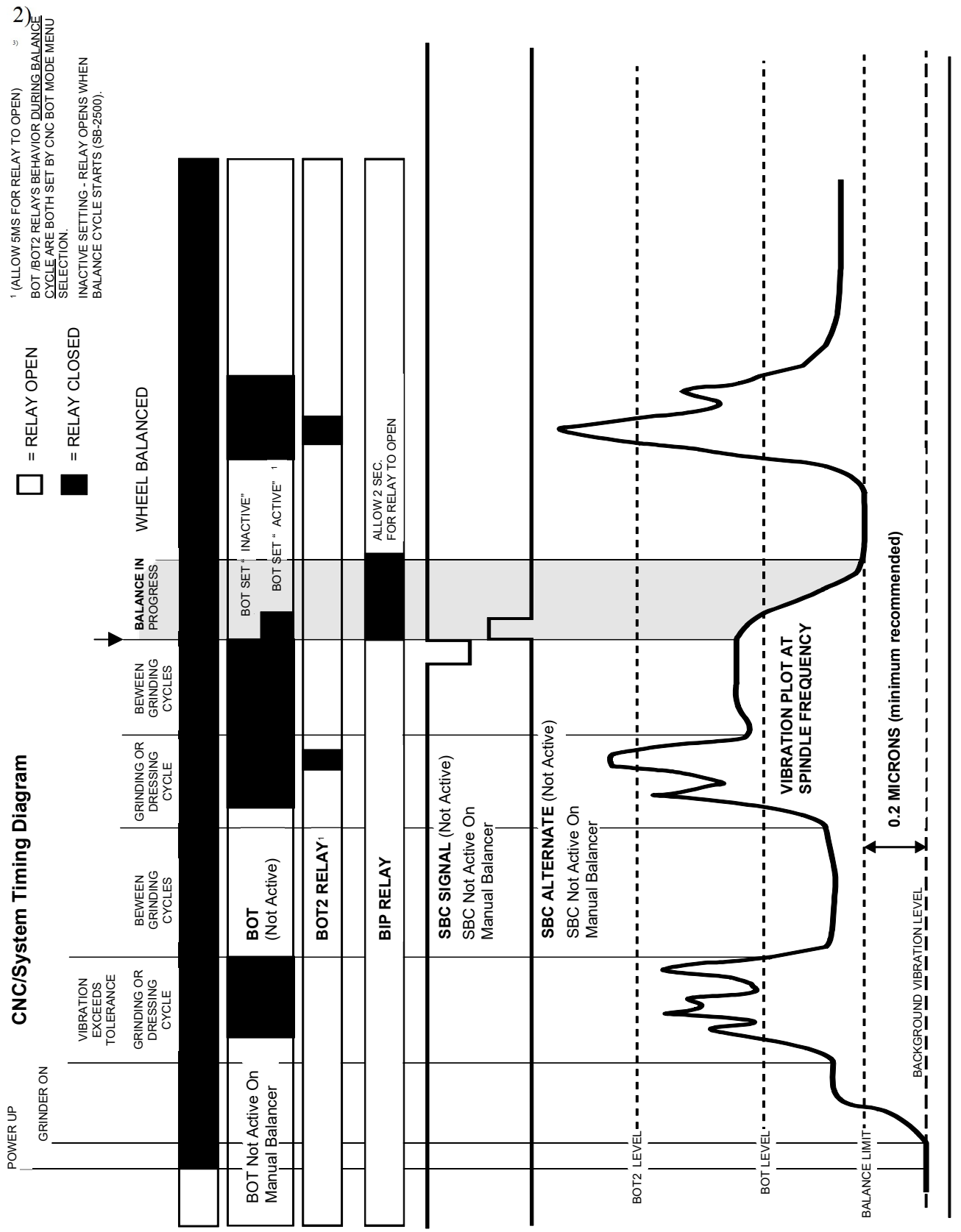
Software Operation Summary

The Software interface capability of the SBS Manual Balancer allows for automated balancing and testing of a grinding machine. For example, if the vibration spectrum of a new machine is recorded, it may be kept for future reference to gauge relative bearing condition, spindle balance and machine condition. The RPM and vibration level readouts from the status line can be used to provide a remote indication of the machine operating speed, and characteristics. This data may be used to indicate when a grinding wheel needs to be changed or other maintenance performed.

Profibus DP Interface

A Profibus Implementation document, along with the required Profibus GSD file, can be downloaded from the SBS website at **https://accretechsbs.com/**.

CNC/System Timing Diagram

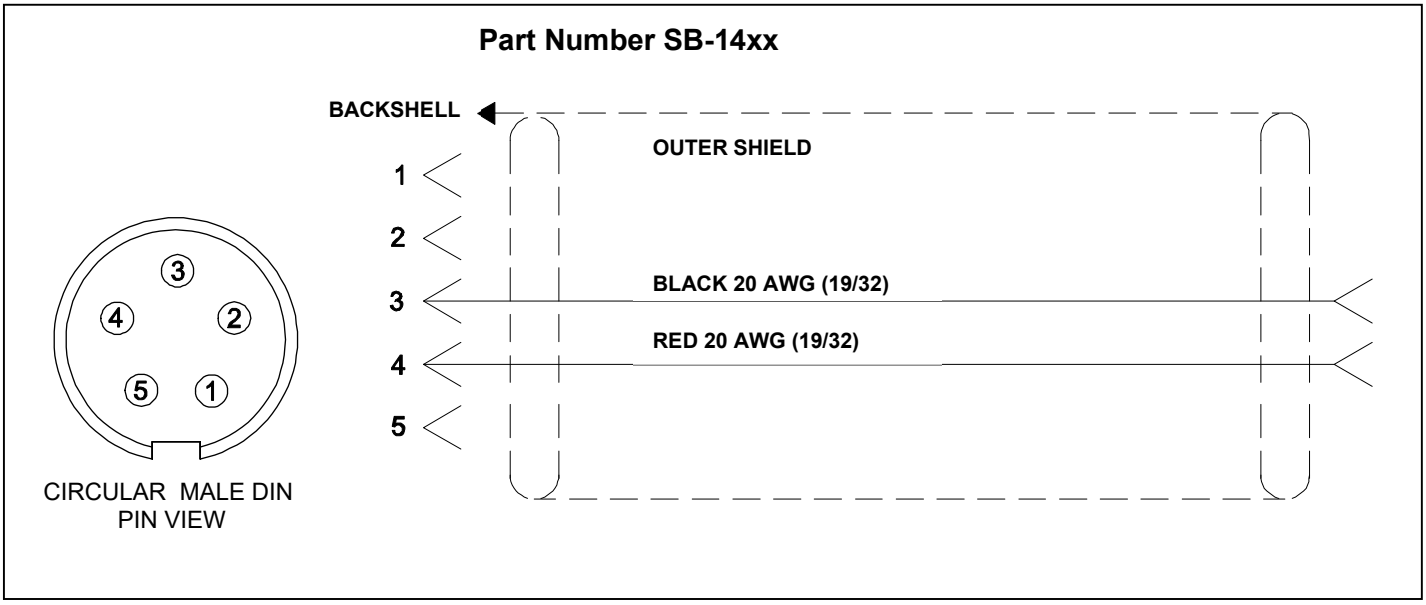


System Maintenance

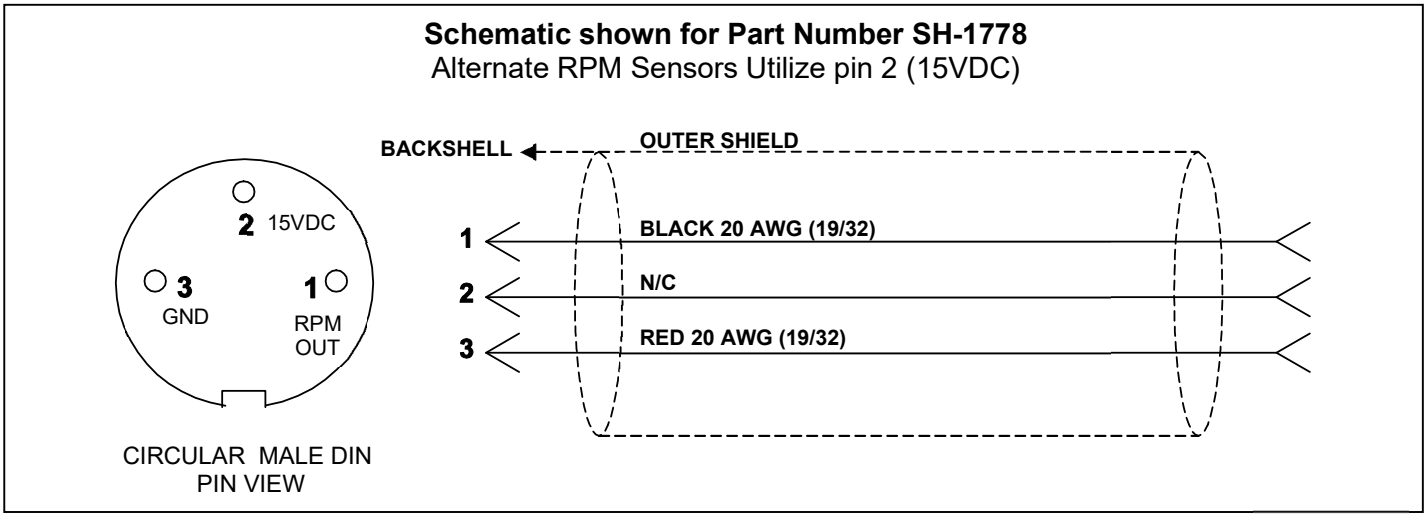
Maintenance

Operator maintenance of the SBS Manual Balancer is restricted to replacement of the line fuse in the Control Unit. Cable schematics for the RPM Sensor and Vibration Sensor follow in order to assist with minor repair or wiring connection work. If further service is required, contact your SBS Manual Balancer source, or Accretech SBS, Inc.

Vibration Sensor Schematic



RPM Sensor Schematic



Trouble Shooting Guide

SBS Return/Repair Policy

Accretech SBS, Inc. policy is to give highest priority to the service needs of our customers. We recognize the cost of machine downtime and strive to deliver same day repair of items arriving by overnight delivery at our facility. Because of the complication and delays involved with international shipments, customers outside the continental U.S. should contact their local SBS source for service support. Before returning any equipment for repair, it is necessary for you to contact Accretech SBS, Inc. for a Return Materials Authorization (RMA) number. Without this tracking number, Accretech SBS, Inc. can not ensure prompt and accurate completion of your repair needs. Failure to obtain an RMA number may result in substantial delay.

This guide is designed to help you if you experience problems with your SBS Manual Balancer.

Step 1 If the Control Unit displays any error messages, refer to the Displayed Error Messages section of the manual for explanation of the message. Contact Accretech SBS, Inc. for assistance as required. **When reporting a service issue, please indicate the Error Code (letter) of all displayed Errors.**

Step 2 Verify that the unit is receiving an RPM signal from the RPM sensor. If no RPM signal is shown with the spindle rotating, adjust the position of the RPM sensor (see manual section: *RPM Sensor Installation*). If position adjustment of the RPM sensor does not produce an RPM signal, the RPM Sensor and Control Unit should both be returned for repair.

Step 3 If the Control Unit displays an RPM signal, but no vibration signal, check the Vibration Sensor. Verify that the Sensor is firmly seated on the machine, its magnet is firmly tightened in place, and it is properly connected to the Control Unit. Also check that the Sensor's position on the grinding machine accurately reflects machine balance *(see: Vibration Sensor Location section)*.

If you continue to receive no reading from the Vibration Sensor, the Vibration Sensor and Control Unit should both be returned for repair.

Step 4 If the control unit's self-check shows no service problem with the SBS System, then investigate environmental/application issues. The background vibration level on the machine should be monitored under operation, and the Balance Limit setting checked against this level. *(*see manual sections on *Environmental Considerations,* and *Setting Operating Parameters)*

If you continue to have problems after following these four steps, contact Accretech SBS, Inc. or your SBS Manual Balancer source for assistance.

Display Test Option

The display can be tested for functionality during control power-up by pressing one of the function buttons above "SETUP", followed by the "SETUP" button. The screen will display a DISPLAY TEST message and list buttons for TEST, START, and SETUP. Pressing TEST will reverse the light and dark text areas. Pressing TEST again will display a full screen with all pixels lit. Pressing again will turn all screen pixels off. Pressing once more will return the screen to DISPLAY TEST. Also displayed are the revision reference numbers for the system main board and display board. The LED status indicators on the left side of the display will sequence through the three colors to check operation. Press the START button to bypass SETUP and resume normal operation. Press the SETUP button to continue to system setup.

Displayed Error Messages

Self-diagnostic software has been incorporated into all SB-5500 Balance Control Units. If a problem ever occurs with an SBS system, It is reported on the front panel display as an error code. Below is a listing of these error codes, a description of when the Control Unit automatically runs each test, how each code is cleared, the definition of each error message, and prescribed action to be taken by the user.

Press CLEAR or CANCEL to manually clear a displayed error message. Once an error is cleared, it will be displayed again when the error condition is next detected. To further isolate defective components a series of test operations accompany some of the error codes.

Please indicate the Error Code (letter) of any displayed Errors when returning equipment for repair. Also please provide as much detail as possible regarding the conditions when problems were encountered, and the symptoms experienced.

Error Code	Message	Definition	Action
A	RPM OUT OF RANGE OPERATION RANGE IS 300-30000 CHECK RPM SENSOR	Checked continuously. Displayed if the RPM signal coming from the Balancer is below 300 RPM or exceeds 30,000 RPM.	Clears automatically. Verify operating speed of the grinding machine. If the machine is running above 30,000 RPM, contact your SBS Manual Balancer source for application consultation. If the machine is running within the operating speed limits, and this error message persists, this indicates a failure of the RPM sensor in the Balancer. The Balancer should be returned for service.
B	VIB SENSOR DEFECT OPEN – CHECK CABLE AND CONNECTORS - SEE MANUAL	Checked continuously. Vibration Sensor presence not detected. This could be caused by a defective sensor or by no sensor being connected.	Clears automatically when sensor detected. Check sensor connections and try Power-On again. Continued error messages indicate the need for repairs to the Sensor.
C	VIB SENSOR DEFECT SHORT – CHECK CABLE AND CONNECTORS – SEE MANUAL	Checked continuously. Vibration sensor short circuit detected.	Clears automatically. Disconnect the balancer from AC power before checking cables and connectors, and sensor for shorts. If the problem cannot be isolated, the sensor, cable, and/or Control Unit should be returned for repair.
G	AUX POWER DEFECT SHORT – CHECK CABLE AND CONNECTORS - SEE MANUAL	Checked continuously. 24V Auxiliary Supply low – fuse open.	Cleared automatically. Determine which component is defective by swapping with another system, or by using the following diagnostic test. Return defective component for repairs. If in doubt, return all items. Test: Check for shorts in cables and connectors and re-initiate system check. Unplugging one cable at a time from the control can help isolate the problem component. If the error persists return Control Unit and cables for repair.

Error Code	Message	Definition	Action
H	RPM/CNC POWER DEFECT SHORT – CHECK CABLE AND CONNECTORS - SEE MANUAL	Checked continuously. 15V Auxiliary supply low – fuse open.	Cleared automatically or by pressing Auto button. Check for shorts in Balancer and machine controller interface cables and connectors and re-initiate system check. Unplugging one cable at a time from the control can help isolate the problem component. If you have the SBS system cabled to your machine controller, verify that the interface cable is free of electrical shorts. The interface cable is not supplied with the SBS system, and repair is the responsibility of the user. If the error persists return Control Unit and cables for repair.
J	NO RPM SIGNAL CHECK CABLES CHECK SPINDLE	Checked continuously. No incoming RPM signal, possible open in RPM sensor circuit.	Cleared automatically or by pressing Auto button. Ensure that the spindle is running, with balancer cable attached at both balancer and control ends. Determine which component is defective by swapping with another system. Return defective component for repairs. If in doubt, return all items.
L	CIRCUIT FAILURE UNABLE TO MEASURE VIBRATION SEE MANUAL	Checked continuously. Signal acquisition circuit failed.	Cleared automatically. No action required other than clearing error. If the problem persists, the Control Unit should be returned for repair.
	INTERNAL VOLTAGE ERROR	Checked continuously. A Fault with one of the internal power supplies of the Control	Note conditions when the error occurred and return the Control for repair.

Support

For support, contact the machine builder or SBS at:

Accretech SBS, Inc.
2451 NW 28th Avenue
Portland, Oregon 97210 USA

Tel.: +1 503.227.7908
Fax: +1 503.223.1258
TechSupport@accretechSBS.com
https://accretechsbs.com/

Appendix A: Specifications

Physical Features

Multiple Device Control
Four (4) available slots accept these control cards:

SB-5512 Mechanical wired balancers
SB-5518 Hydro Balancers
SB-5522 Acoustic Emissions Monitoring System
SB-5523 ExactDress™ process monitoring
SB-5560 ExactControl™ process monitoring
SB-5562 Studer AE Control™ process monitoring
SB-5532 Mechanical non-contact balancers
SB-5544 Manual balance control

SB-4500 Compatible
Operates with existing balancers/cables, sensors, CNC/PCL Hardwire Interface

Display
Type: Color TFT LCD
Active area: 480H x 272V pixel
3.74 inch [95mm] x 2.12 inch [53.86mm]

Multi-language Capability
English, Chinese, French, German, Hungarian, Italian, Japanese, Polish, Portuguese, Russian, Spanish, Swedish

Communication Interfaces
Ethernet TCP/IP, USB 2.0, Profibus DP, CNC/PLC Hardwire Interface (opto-isolated outputs)

DC or AC Power Options

DC Supply: Input 21 VDC to 28 VDC. 5.5A max at 21 VDC. Reverse voltage protected.

Connector: Molex 50-84-1030 or equiv.
Contacts: Molex 02-08-1002 or equiv.

AC Supply: 100-120 VAC, 50/60 Hz, 2A max; 200-240 VAC, 50/60 Hz, 1A max. Main supply voltage fluctuations not to exceed +/-10% of nominal supply voltage.

Performance

RPM Reporting
300 to 30,000 RPM

Sub-micron Vibration Range
50 µg to 1.25g

Vibration Display Resolution
Three user selectable options
1) 0.1 µm 0.01 mil 0.01 mm/s 1 mil/s
2) 0.01 µm 0.001 mil 0.001 mm/s 0.1 mil/s
3) 0.001 µm 0.001 mil 0.001 mm/s 0.01 mil/s

Vibration Display Repeatability
6,000 RPM ±1% @ 5.0 µm
300 – 30,000 RPM ±2% @ 50:1 signal to noise

Vibration Display Accuracy
6,000 RPM ±2% @ 5.0 µm
300 – 30,000 RPM ±4% @ 50:1 signal to noise

Balance Resolution
0.02 microns displacement at 6,000 RPM

Vibration Filter
Custom digital filter has bandwidth +/- 3% of measurement RPM

Certifications
ETL and CE certified
https://accretechsbs.com/

Environmental and Installation

SB-5500
Pollution degree 2
Installation category II
IP54, NEMA 12
Environmental temperature range: 5°C to +55°C

SB-5575/80/76/81
Pollution degree 2
Installation category II
IP20
Environmental temperature range: 5°C to +55°C

Vibration Sensor

Sensitivity Range	+ /- 25g
Sensitivity Resolution	0.0001g
Voltage Sensitivity	100 mV/g
Excitation Current	2 to 8 mA
Frequency Response	0.5 to 5000 Hz
Operating Temperature	0 to +70 C

Appendix B: Replacement Parts List

Part#	Description
RPM Sensor	
SH-1778	RPM Sensor
SH-1779	RPM Extension Cable
Controls/Options	
SB-24xx-L	Hardwire Interface cable (standard lengths)
SB-43xx	Remote Keypad Cable for SB-5500
SB-5500	CONTROL UNIT (Expandable to 4 Card slots)
SB-5512	Additional Mechanical Balancer Card
SB-5518	Additional Hydrokompenser (water balancer) Card
SB-5522	AEMS Gap/Crash Monitoring System Card
SB-5543	Manual Balance Card
Vibration Sensors	
SB-14xx	Sensor Cable (standard lengths)
SB-16xx	Sensor Ext. Cable (standard lengths)
Control Mounting Hardware Options	
SK-5000	Rack Panel: SB-5500, Full Wide w/ 1/2 Blank, 3U
SK-5001	Rack Panel: SB-5500, Partial Wide 3U w/ Handles
SK-5002	Rack Panel: SB-5500, 1/2 Rack 3U Bracket
SK-5003	Control Mount: SB-5500, Bottom Flange
SK-5004	Control Mount: SB-5500, 90 Deg. Bracket, Cabinet
SK-5005	Keypad Mount: Flush Panel Frame Kit
Other Parts	
EC-5605	A/C Control Fuse, 3 amp time lag 5x20 (2 required)
EC-5614	D/C Control Fuse, 6.3 amp time lag 5x20
CA-0009	Power Cordset
CA-0009-G	Power Cordset (Germany)
CA-0009-B	Power Cordset (British)
SB-8510	Complete SBS Balancer Low Profile Collector replacement
SB-8520	Collector Slip Ring Block Replacement
SB-8530	Collector Slip Ring Post Replacement
MC-8516	Collector RPM Sensor Replacement
CA-0121	12-pin Male DIN (control end plug of Balancer Cable for 48xx series cables)
CA-0125	Standard 7-Pin Female Bayonet Connector (Balancer end of Balancer Cable)
CA-0105	Heavy-Duty 7-Pin Female Bayonet Connector (Balancer end of Balancer Cable)
SB-1300	Adjustable Hook Pin Spanner (Adapter Flanges)
SB-1311	Adjustable Face Pin Spanner 1/4” pins (Small Adapter Nuts)
SB-1321	Adjustable Face Pin Spanner 3/8” pins (Large Adapter Nuts)

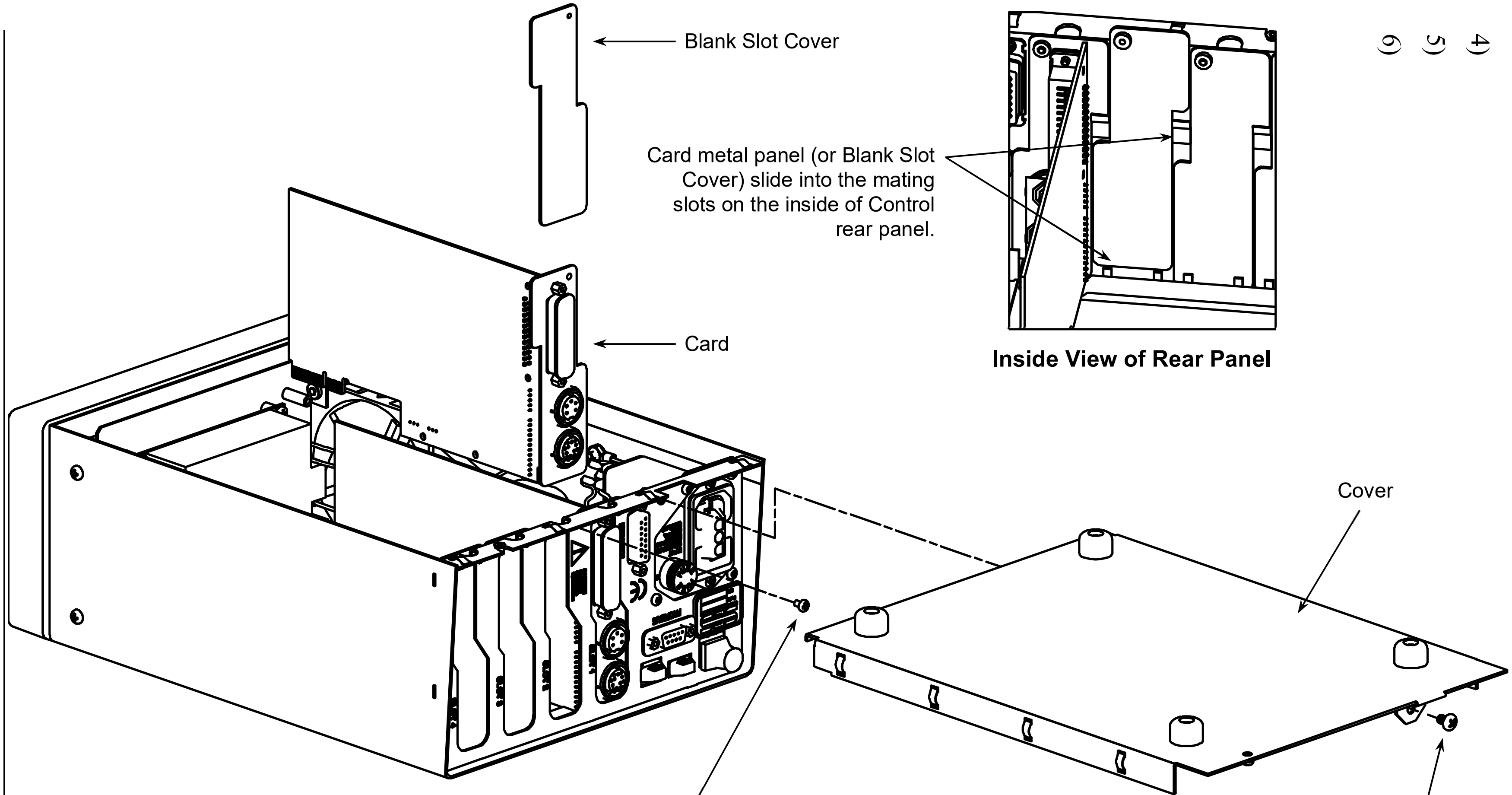
xx in P/N = cable length in feet
Standard options 11 [3.5m], 20 [6.0m], or 40 [12.0m], e.g. SB-4811 = 11ft [3.5m]

Appendix C: Balancer Card Installation

4)

5)

6)



Tools Required:
1. Philips Screw Driver
2. Grounding Wrist Strap

Procedure:
1. Unplug Unit, invert, and lay on an ESD Safe Surface.
2. Remove Cover Screw at Back Panel of Control.
   For small chasses (e.g. SB-5575) remove 4 cover screws.
3. Remove Slot Screw and Blank Slot Cover.
4. Plug Card into Main Circuit Board while sliding Card metal plate into mating slots on inside of Rear Panel.
5. Install Slot Screw to secure Card.
6. Install Cover and Tighten Cover Screw.

Unit is shown upside down with the cover removed.

Safe handling requires that technician have the unit open or cards out of ESD bags only on an ESD-safe work surface, and only when the technician is properly grounded

Note: All Service (including card installation) should be performed by a qualified technician, or the unit returned to Accretech SBS, Inc. for service.

Appendix D: System Connection Diagram