SB-1000 Balance Control
Operation Manual

LL-1100 Rev. 1.2

Productivity through Precision™

DYNAMIC BALANCE SYSTEM

DYNAMIC BALANCE SYSTEM
A Product Line of Schmitt Industries, Inc.

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Operation and Specification Manual

for the

SB-1000 Balance Control

LL- 1100

Manual Revision # 1.2

Corporate Offices
2765 NW Nicolai St.
Portland, OR 97210 USA

sbs-sales@schmitt-ind.com
Tel: +1 503.227.7908
Fax: +1 503.223.1258

www.schmitt-ind.com

Schmitt Europe Ltd
Ground Floor Unit 2
Leofric Court, Progress Way
Binley Industrial Estate
Coventry, CV3 2NT, England

enquiries@schmitt.co.uk
Tel: +44-(0)2476-651774
Fax: +44-(0)2476-450456

www.schmitteurope.com

Benefits of SBS SB-1000 Balance Control:

- Enhanced digital electronic design with increased operating life and reliability
- Easy to install and operate
- Increases throughput by saving setup time
- Improves part quality by automatically balancing to 0.02 micron
- Longer life for grinding wheels, dressing wheels and spindle bearing
- Icon based User interface for international adaptability
- Backed by world-class SBS customer service
- Works with existing SBS installations

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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 Balance System 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**
- **Attractive Purchase Price**

Operator Safety Summary

This summary contains safety information necessary for operation of the SBS Balance System 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 Balance System, it is necessary to read and understand the entirety of this manual. After reading the Operation Manual, contact Schmitt Industries 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 Balance System components to the grinding machine spindle, including the proper use of provided adaptor lock screws, 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).

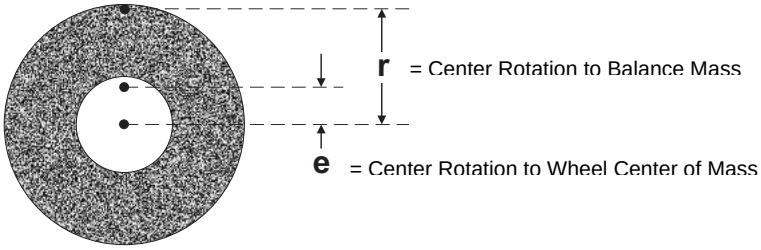
Caution: Only qualified service technicians should attempt to service the SBS Balance System. To avoid electric shock, do not remove the cover of the Control Unit, or remove cables, with power connected.

Balance Theory

The SBS Balance System 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)

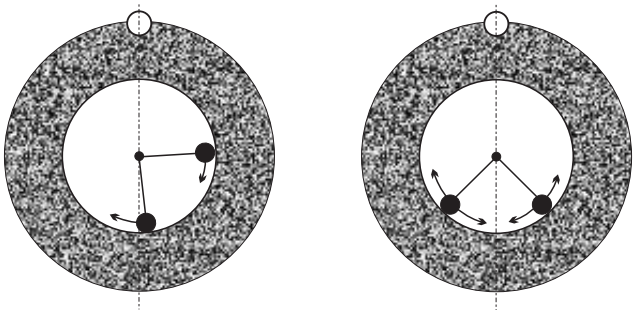
Measured Imbalance = r (Balance Weight Mass)



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.

The SBS system with SB-1000 control can operate in either Automatic Balance mode, or Manual Balance mode in order to correct for wheel imbalance.

Automatic Balance Overview

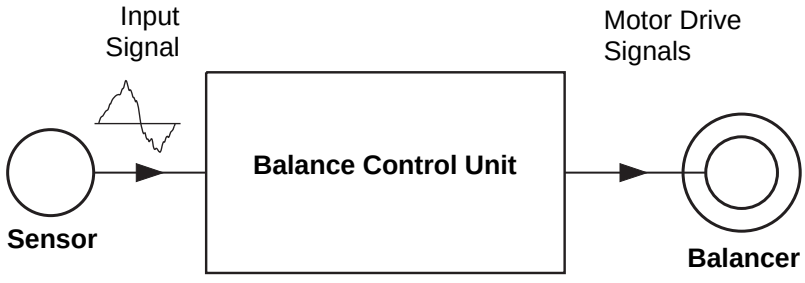


2a - Unbalanced **2b - Balanced**

In automatic balance mode the SBS Balance System uses two movable weighted masses located in the Balancer to correct for various and changing imbalances which occur on the grinding machine. The balance weights are driven by high torque electrical motors through a precision gear train, and can be independently positioned to compensate for any imbalance within the specifications of the system.

The automatic balance cycle is complete when the balance weights are positioned so that minimum vibration is achieved. Figure 2a shows an unbalanced rotating grinding wheel, with an SBS Balancer installed. The imbalance is represented by the white dot located on the circumference of the wheel, while the two black dots represent the weights located in the balancer. By incrementally repositioning the weights, a triangulation is achieved which cancels out the imbalance, as shown in Figure 2b.

The system consists of the Balancer, a Balancer Cable, a Vibration Sensor, and the SB-1000 Control Unit. Imbalance is expressed as spindle 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. When an Auto-balance cycle is initiated, the control unit drives the two balancer weights in the direction that reduces the amplitude of the incoming vibration signal.

Manual Balance Overview

The SB-1000 control can also be configured to be used as an aid in performing manual balance operations, where the cost of a fully automatic system is not warranted. The SBS balancer is not needed when the system is used in manual balance mode. Instead an RPM sensor is used to monitor the RPM and phase position of the rotating spindle. An RPM signal not time synchronized to a physical location on the spindle assembly (from the motor or other source) is not adequate to achieve balance. An RPM sensor with a fixed position trigger point must be used to allow the phase position of the spindle to me determined.

Balance weights are either moved or added on the grinder manually by the operator as needed to achieve balance. The SB-1000 assists the operator by analyzing the current balance condition of the grinder and showing the operator how to position weights to achieve balance.

Environmental Considerations

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

Other Sources of Vibration

A 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 also include components mounted on the machine itself, such as pumps, motors, drives, etc.

The SBS Balance System may not operate efficiently under the influence of some external vibrations. The system filters the vibration signal it detects from the grinding machine by the frequency of the spindle RPM. Vibrations occurring at frequencies other than that of the rotating wheel will be ignored by the system. However if adjacent machinery or auxiliary equipment on the grinder is operating near the same frequency as the spindle rotation, the system will not be able to distinguish between vibrations occurring from wheel imbalance and those originating elsewhere.

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 Balance System can help perform this test but cannot remove these vibrations *(see: Background Vibration section)*.

Machine Condition

Grinding machine condition is an important factor in determining the minimum balance level that the SBS Balance System can achieve. The spindle should be balanced, as well as all components in the spindle drive train (i.e. belts, pulleys, motor, etc.). The balance system 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 Balance System cannot remove vibration resulting from machine condition problems.

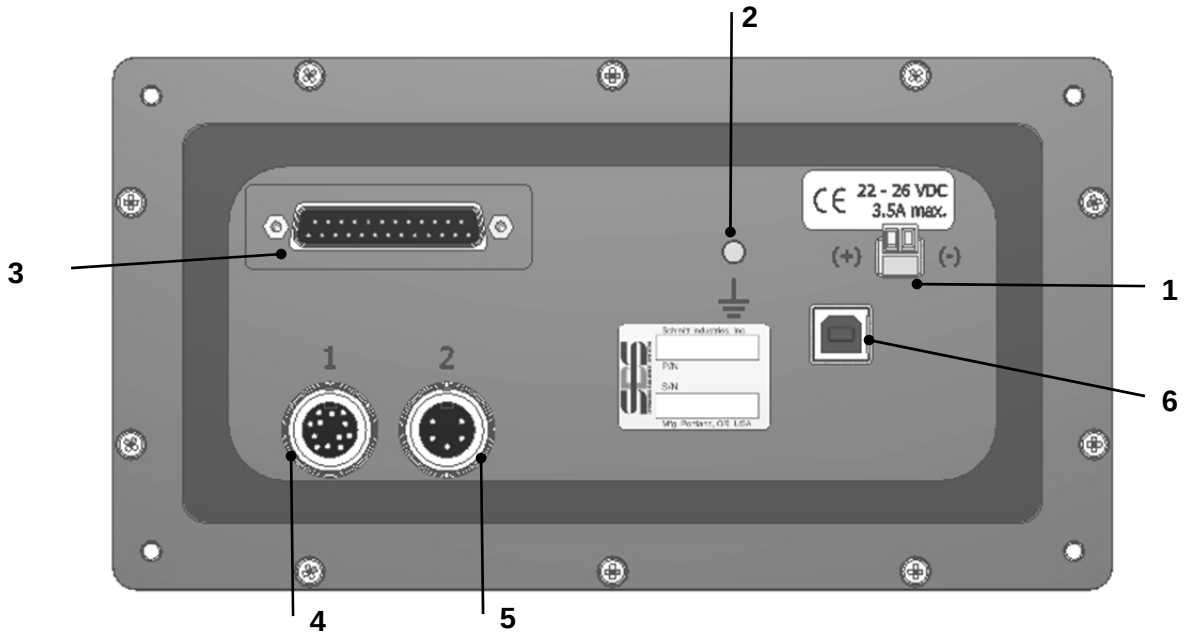
System Installation

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 vertical surfaces or for rack mounting.

Rear Panel Connections

The following connections are located on the rear panel of the Control Unit.



1) POWER SUPPLY. Terminal block connection for power input. 22 VDC to 26 VDC, 3.5A max at 22 VDC. There is no power switch on the SB-1000, as it is designed for constant operation. If power must be disconnected by the user, a separate switch on the power line may be installed at installation.
Caution: Before applying power to the Control, make sure the supply voltage is within specified range.

2) Earth Ground. Connect this M5 stud to the GND.

3) Optional CNC Interface. Standard DB-25 connector for connecting to a grinding machine controller. A complete description of this relay based interface is given in the "Hardwire Interface" section

4) Balancer/RPM Sensor (labeled 1). 12-pin DIN connection to either the SBS Balancer cable (Automatic Balance mode) or to the RPM Sensor (Manual Balance mode).

5) Vibration Sensor (labeled 2). 5-pin DIN connection to Vibration sensor.

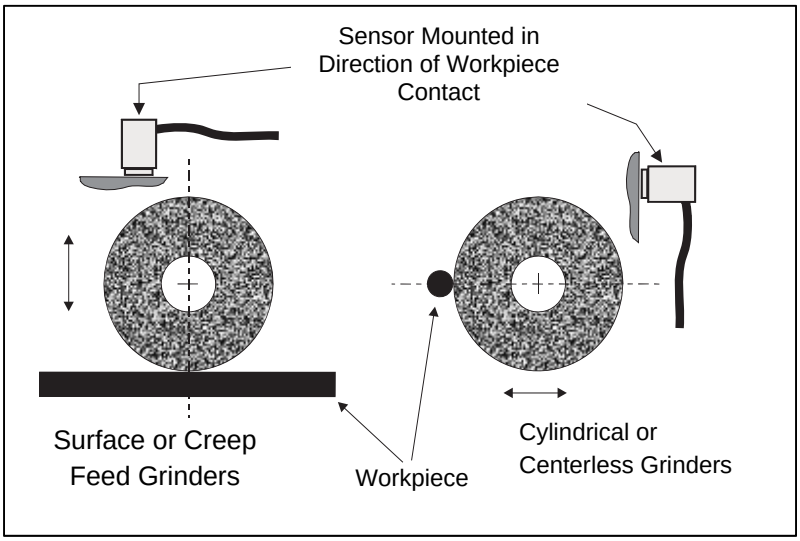
6) USB connection. Allows USB 2.0 connection to host computer for Firmware update of the control only. Latest firmware for the control and update instructions are available on the SBS website www.grindingcontrol.com.

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, using an M5 set screw. 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 Balance System. 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 balance system 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.

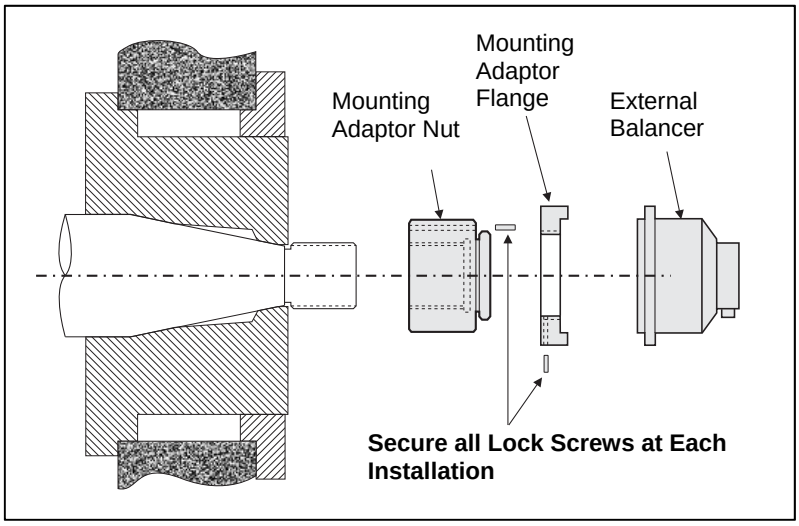
External Balancer/ Adaptors – Automatic mode

The Balancer is mounted to the machine spindle with the provided adaptor. The mounting adaptor is specifically designed to accommodate a particular machine's spindle configuration, and varies in design. In general the adaptor consists of two parts. The **Adaptor Nut** mounts on the grinding machine, usually replacing the spindle nut of the machine, either on the wheel or pulley end of the spindle. The **Adaptor Flange** bolts to the Balancer, and threads onto the installed Adaptor Nut. Appropriate wrenches are supplied for both parts. Use of a lubricating compound between the Balancer and Mounting Adapter is recommended to ensure ease of future disassembly.

Lock Screws are a feature of many adaptor designs, where required by high machine speeds or machine spindle braking. These consist of M6 socket set screws in the face of the Adaptor Nut, and M5 socket set screws in the outer diameter of the Adaptor Flange. These lock screws should be loosened prior to adapter removal or disassembly.

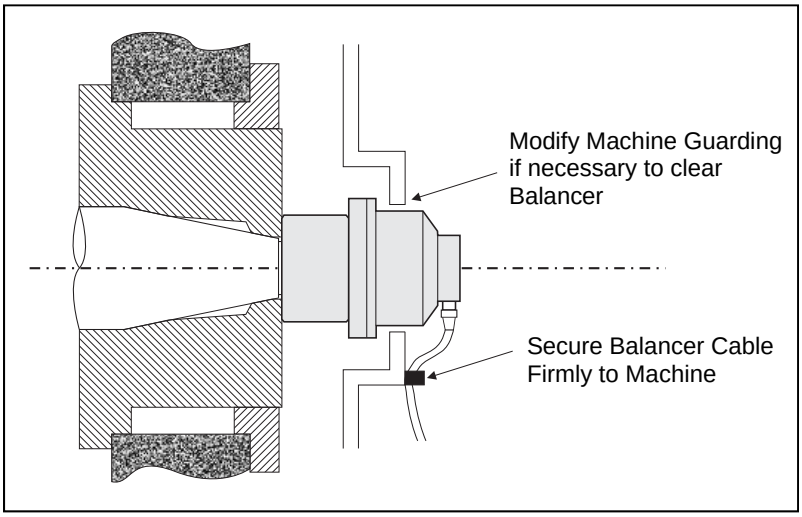
Warning!! - All lock screws must be properly secured <u>each</u> time the Adaptor Nut or Adaptor Flange is installed to preventing the assembly from coming loose during operation of the grinder. Screws should be **wrench tight** (torque provided by a standard hand wrench, without hammer or other tools).

Follow this assembly procedure to ensure proper mounting of Adaptor Nuts and Flanges were lock screws are part of the adaptor design:



1. Loosen all lock screws before assembly. The engagement end of these screws should be below flush with the face of the adaptor/flange where they exit.
2. Screw the Adaptor nut onto the machine wrench tight, using the supplied wrench. Use of hammers or wrench extension bars is not advised.
3. Tighten all the lock screws in the Adaptor Nut wrench tight.
4. Thread the Balancer/adaptor flange assembly onto the mating threads on the Adaptor Nut.
5. Tighten the lock screws in the Adaptor Flange wrench tight
6. All lock screws must be fully loosened before attempting removal of these parts from the machine.

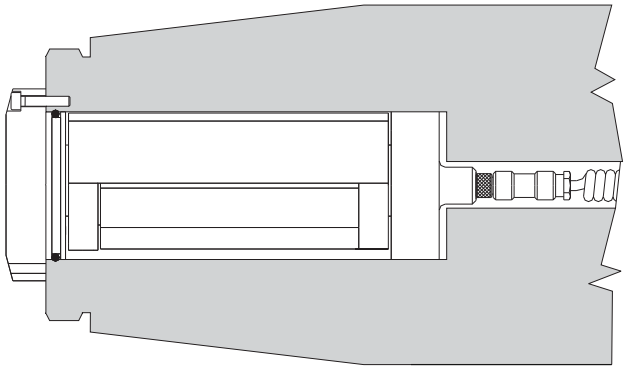
The Balancer must be checked for machine clearances at installation. Make sure there is no interference between the Balancer/adaptor assembly and any part of the machine (e.g. workhead, tailstock), especially with the wheel at its smallest diameter. Modify the machine guarding if needed to provide clearance from the Balancer. Machine guarding should be modified to allow the rotary junction and cable to extend outside the guard.



The Balancer Cable should be restrained to prevent the cable from being caught up in the rotating machine, but should allow for the cable's removal as necessary during wheel changes. Optimally, the cable should be secured so that the connector on the Balancer points down, as shown in the diagram. This position will minimize the chance of fluid or swarf entering the connector when opened during wheel changes. If heavy wheels are being changed, remove the Balancer from the area during wheel changes. Most adapters for larger machines are of a two piece design, which simplifies this process. **Maintenance Note:** SBS Cable connectors are IP67 fluid sealed when closed, but subject to contamination when open. Care must be taken to clean out the pin area of cable connectors prior to <u>each</u> re-connection to prevent premature connector failure. SBS recommends the use of an electrical contact spray lubricant for this purpose.

The previous installation drawings show the balancer mounted on the wheel end of the grinder spindle. Other balancer installation options are available including mounting an External Balancer to the pulley or drive end of the spindle (where machine construction permits). Internal Balancers are also available that mount inside an OEM supplied bore inside the machine spindle.

Internal Balancers – Automatic mode



Internal Balancers are designed for mounting inside the machine spindle. The machine manufacturer must provide a precision-machined mounting bore as part of the design of the grinder's spindle in order to accept an internal balancer. This figure shows an internal balancer mounted in the wheel end of the machine spindle with cable connection to the back side of the spindle. This mounting style is typical, although other designs are available. Mounting instructions are provided with each model.

The internal balancer shown with cabled connection to the SBS collector, which is mounted separately at the rear end of the spindle (not pictured). With other versions of the balancer, the collector can also be mounted at the wheel end of the spindle, directly attached to the balancer, eliminating the need for the cable bore down the center of the spindle.

RPM Sensor – Manual mode

An RPM Sensor is required in Manual Balance mode. The SBS sensor SB-1800 (pictured below) is a proximity type sensor with M12 cable connection. This sensor is recommended for permanent installations. The cable is sold separately in different lengths.

The sensor must be mounted on a stationary part of the grinder, and be positioned to face a trigger feature on the rotating part of the spindle assembly. The sensor must be mounted inline with the trigger feature and within 2mm distance of the trigger feature surface as it passes under the RPM sensor. The trigger feature must be a once per revolution feature. It can be either a hole of minimum 8mm diameter or a protrusion from the regular surface of the same size; however SBS recommends a hole be used for safety reasons.

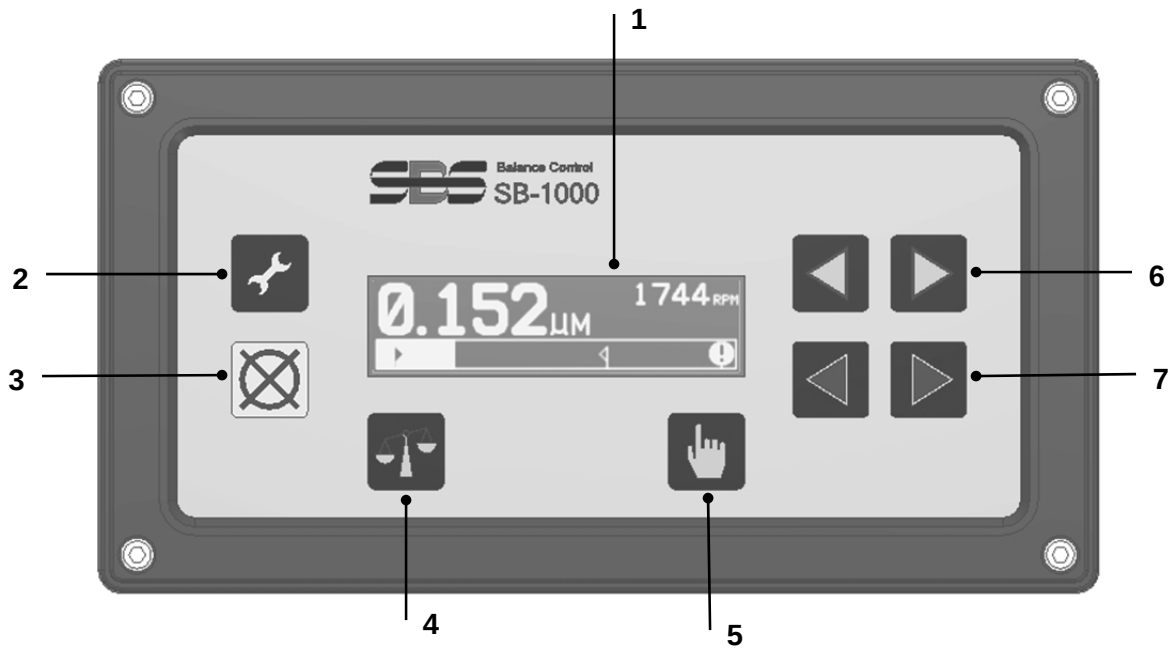
An optical sensor is also available for use with reflective tape as a trigger, part SB-1802. This sensor has the same size and configuration as the proximity sensor.

An RPM signal by itself (from the motor or other source) is not adequate to achieve balance, as an RPM sensor with one fixed position must be used to allow the phase position of the spindle to me determined.

Control Unit Operating Instructions

Front Panel Controls

The following figure illustrates the front panel of the Balance Control Unit.



1) LCD Display. This screen is used to display data and show current settings and status information. Information is displayed using a symbol based interface, which is independent of language. The display will dim over a period of about 24 minutes when inactive (no user button presses).

2) Setup button. Press to access the operational settings of the control. Press and hold this button to access the screen for selection of single machine or multiple machine operation.

3) Cancel button. Press to cancel the operation in progress, or cancel the last selection or entry made. This button also clears any displayed error message.

4) Balance button. Press to start a balance operation (either automatic or manual, depending on current mode set).

5) Manual button. When in **Automatic Balance** mode press this button to access the Manual Weight Movement screen, which allows the user to change position of the weights in the installed SBS balancer. When operating in **Manual Balance** mode, this button is used to perform various steps in the manual balance process.

6) buttons. Manually move Balancer Weight 1, or change value of currently selected digit.

7) buttons. Manually move Balancer Weight 2, or select digit.

Startup and Operation

Power-On Display

Power on display shows only after power is applied, and displays for 2 seconds. Press and hold the Cancel button to extend the duration of this display until button is released. For support reference, the installed Firmware rev. is displayed at the right side of this screen, and below that the FPGA code rev.

Multiple Machine Operation

Press and hold the Setup button to access the screen for selection of single machine or multiple machine operation.

The first icon selects single machine operation, and the second icon selects multiple machine operation. When in multiple machine operation, the control saves setup information for up to eight separate machines, using a machine ID number of 1-8. This is useful where the control will be moved between machines with different setup requirements. Single machine operation should be used for a dedicated installation.

When Multiple Machine operation is selected, the power up screen for the control is immediately followed by the machine selection screen. This allows the user to verify that the selected machine ID matches the ID of the machine the control is operating on. It is recommended that the grinding machines in such a scenario are labeled with the appropriate machine ID number for reference.

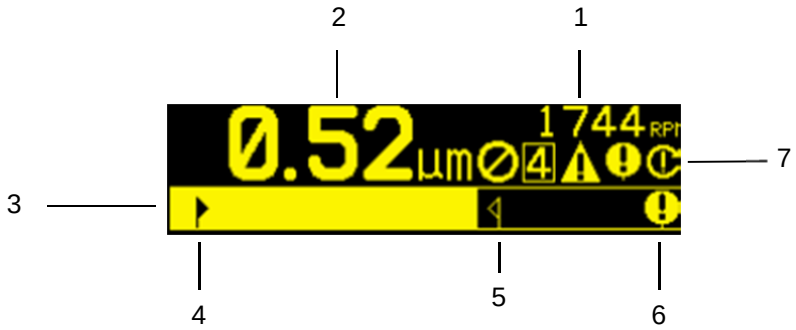
The first screen shown indicates that machine 3 is selected and it is setup for Manual balance mode ( ). The second screen indicates that machine 4 is selected and it is setup for Automatic balance mode ( ). If no balance mode is setup for a particular ID number, then the ( ) on screen will be empty. This indicates an available or unused ID.

Use the arrow buttons to change the machine number selected.

Pressing will accept the current selection and go to the Main screen.

Pressing will accept the current selection, and show the select balance mode screen, allowing the balance mode to be changed for the selected machine.

Main Screen



This is the main display screen of the SB-1000, regardless of the balance mode set (automatic or manual). The basic features are as follows:

1. 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 Weight Movement).
2. 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.
3. 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.
4. Balance Limit. This fixed position on the graph indicates the current level set for the Balance Limit, relative to the measured vibration level.
5. Balance Tolerance. This fixed position on the graph indicates the current level set for the Balance Tolerance, relative to the measured vibration level.
6. Critical Balance Level. This fixed position on the graph indicates the current level set for the Critical Balance, relative to the measured vibration level.
7. Status indication area. Displays a number of icons to indicate status conditions. The general status indications, common to both automatic and manual balance modes are as follows:
   a. ⊘ - Front Panel Inhibit (FPI)
   b. 4 - Machine ID number selected (shown only in multiple machine operation).
   c. ◥ - Tolerance Level exceeded. (Not shown) The symbol will display and flash in the same position as the ❗ symbol shown on the screen if the vibration is over the level set by the user for Balance Tolerance.
   d. ❗ - Critical Balance exceeded. The symbol will flash if the vibration level is over the Critical Balance level user setting.
   e. Ⓒ - Critical RPM exceeded. The symbol will display and flash if the RPM level is over the Critical RPM user setting.
   f. ⚠ - Error Condition. The symbol is displayed only if an error condition is present, but was hidden by the user by pressing ⊠ Cancel. Press ⊠ again to display the hidden error(s).

Preparing to Set Operating Parameters

Ensure you fully understand the function and operation of the Control's front display panel as described in previous sections, before attempting the following operations.

Background Vibration

A check of the background vibration level must be performed, to correctly set up the system.

Install the Balancer, Control, and all cables as indicated in the installation section of the manual. Leave the grinding machine off, press the Manual button to manually enter the operational RPM of the grinding machine. Note this measured ambient vibration level without the machine running.

Turn on all secondary machine systems (such as hydraulics and motors), but leave the machine spindle turned off. The vibration level displayed without the spindle running is the background vibration level for the machine. Note this background vibration level for future reference in setting the operating parameters of the system. Refer to the "Environmental Considerations" section for explanation of possible sources of background vibration.

Verifying Balancer Sizing – Automatic Balance Mode

Using the Manual Weight Movement buttons, rotate the masses in the Balancer while the machine is operating at speed. By running each of the two weights in opposite directions, the operator should be able to introduce more than three microns of vibration in the grinding machine, but not more than thirty microns. For grinders that operate at higher speeds (above 5000 RPM), the range of acceptable Vibration produced by balancer movement should be lowered. If results do not fall within this range, it may be a sign that the Balancer needs to be re-sized for your application. Contact your SBS Balance System provider for consultation. In the interim, do not allow the grinder to operate for extended periods with high vibration levels.

Limit

The SBS Balance System will automatically balance to a user specified low-limit of vibration, the Auto-Balance Limit. The Limit represents the best balance achievable, and is the target vibration level during an automatic balance cycle. It is factory set at 0.4 microns displacement. A balance Limit of 1.0 micron or less is generally considered adequate for most applications. The Limit should be set **at least** 0.2 microns higher than the highest background vibration level noted in the "Preparing to Set Operating Parameters" section. **The lower the Limit is set, the longer the system will require achieving balance.** Some experience may be necessary to determine the appropriate auto-balance Limit for a particular installation.

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**.

Tolerance

This setting establishes an upper-limit for normal process vibration for the grinder. When reached, this setting will cause an indication of the need to perform an Auto-Balance. Indications given on the front panel for balance status are shown, and additional indication is given via. the Hardwire Interface. The Tolerance level is typically it is set at least 1 micron above Limit setting.

Critical Vibration

This setting establishes an operational upper safety limit of vibration for the system. When reached, this setting will cause an indication of the critical need to perform a re-balance operation. This indication on the

front panel is shown, and additional indication is given via. both the Hardwire and Software Interfaces. The Critical level is typically set **at least** 5 microns above the Tolerance setting.

Timing of Auto-Balance

Grinding wheel contact with a work piece or dresser will produce higher vibration levels on the grinder. This is normal and these levels may exceed the Tolerance level, however this vibration is not related to wheel balance. Checking the vibration level manually or by the Hardwire interface to determine if there is need to rebalance should only be done at points in the grinding process when grinding or dressing are not occurring, such as between parts cycles. Auto-Balance cycles should also only be run at these same points in the process. Attempting to run Auto-Balance cycles while in the grind or dress process will not be effective, and likely will worsen rather than improve balance on the grinder.

Setup Overview

Select Balance Mode (Automatic or Manual)

The SB-1000 can be operated in two separate modes, Automatic Balance, or Manual Balance. Automatic Balance mode uses an SBS Balancer to perform fully automatic balancing operations. Manual Balance mode uses an RPM sensor instead of the SBS Balancer. In this mode the control acts as a balance analyzer and directs the user how to manually position balance weights on the spindle assembly to achieve balance. Press and hold the Setup button for one second to display the balance mode selection screen.

- Automatic Balance Mode
- Manual Balance Mode

The ◁ ▷ or ◀ ▶ buttons will change the selected mode. The selected mode is highlighted, with Automatic mode being selected in the above screen. Press Setup or Manual button to accept the current selection. Press Cancel to exit selection without saving changes. The next screen displayed will be the first setup screen in the active mode.

Setup Mode Operation

There are a number of user selectable operating settings for the SB-1000, which are found under the Setup menu. Press the Setup button to enter the menu of setup options. When the SB-1000 is in setup mode, the symbol is displayed on the upper left corner of the screen. Setup mode will time out after 1 minute of inactivity and the unit will return to the Main screen without saving any unsaved changes. The hardwire interface output relays will remain active during setup.

Most settings are represented by symbols that represent the options the user can select between on that setting screen. When a setting screen is displayed an underline indicates which option is currently set, and that option symbol will also be highlighted. Either the ◁ ▷ or ◀ ▶ buttons can be used to change the current selection.

Some setting screens require a number to be set. Where a number needs to be entered, the ◀ ▶ buttons are used to select the digit to be changed (move the underline). The ▷ button increments the number at the underlined digit, and the ◁ button decrements the same digit. Holding the arrow button will start an accelerating repetition of the button press.

The symbol at the right side of the screen will flash whenever there is unsaved settings data. Data is saved by pressing either the Setup button or the Manual button.

Pressing the Setup button will save data and advance to the next setting in the menu. From the last setting screen in the menu, the unit will exit setup mode and return to the Main screen. To advance to the next setting without changing a setting, just press the Setup button without using any arrow buttons.

Pressing the Manual button will save data and exit setup mode, returning to the Main screen.

Pressing Cancel will discard unsaved changes and revert to the previously saved data. If there is no unsaved data, Cancel will exit setup mode and return to the Main screen.

A display option is available for FPI mode. This setting controls if the current vibration reading is displayed or hidden (***.*) when FPI mode is activated.

Automatic Balance Mode

Setup Automatic Mode

There are four settings under the Setup button in this mode. These settings are described in the "Preparing to Set Operating Parameters" section. Each press of the Setup button will present each of these settings in the following sequence.

	The Limit setting is displayed at the first press of the Setup button. The Limit indicator flashes to emphasize this mode. The edit range is 0.02 to (Tolerance – 0.2).
	The Tolerance setting is displayed at the next press of the Setup button. The Tolerance indicator flashes to emphasize this mode. The edit range is (Limit + 0.2) to (Critical – 0.2).
	The Critical Vibration setting is displayed at the next press of the Setup button. The Critical indicator flashes to emphasize this mode. The edit range is (Tolerance + 0.2) to 99.99.
	The Critical RPM setting is displayed at the next press of the Setup button. The Critical RPM indicator flashes to emphasize this mode. The edit range is 300 to 30100, and OFF displays 0.

Automatic Balance Operation

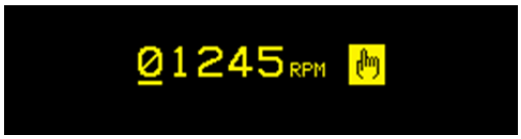
From the Main screen press the Balance button to start an Auto-Balance cycle. This screen displays for the duration of the balance cycle, showing the symbol in the status area of the screen (below the RPM indication). The Balance cycle can also be started or terminated from the hardwire inputs. A Balance cycle may be run with an accurate Manual RPM value entered if there is no incoming RPM signal.

The symbol will rock back and forth during the balance cycle to indicate activity, and the Weight indicators will show + / - to show weight activity and direction. The balance cycle continues until the Limit setting is reached, or the cycles fails and times out.

Press Cancel to end the balance cycle at any time. Upon completion or termination the display returns to the Main screen.

Manual Weight Movement - Automatic Balance Mode

The SB-1000 in Automatic Balance also allows the weights in the SBS Balancer to be operated manually. The ability to move the balance weights is useful for performing diagnostic tests and allows operators to manually balance machines where needed. From the Main screen press the Manual button to display the Manual Weight Movement screen, showing the symbol in the status area of the screen.

	If an incoming RPM signal is not detected, then this screen will request a "Manual RPM" value be entered. The RPM value is changed using the arrow keys. Press Manual, Setup, or Cancel to go on to balance mode (Cancel will not save the new RPM). The Manual RPM value will be used until an actual RPM signal is detected, which will then replace it.

The Manual Weight Movement screen can be used to move the weights in a balancer.

The buttons will move one of the balancer weights in the indicated direction. The buttons will move the other balancer weight in the indicated direction. Pressing a button will cause a 30 ms motion followed by a short pause, and then the weight will move continuously until the button is released. The displayed arrow will fill in to show weight activity. Only one weight can be moved at a time.

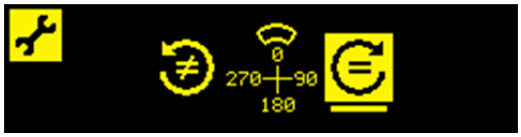
Cancel will exit setup mode and return to the Main screen, Setup will go to Setup Mode, and Balance will start an auto balance cycle.

Manual Balance Mode

Setup Manual Mode

In Manual Balance mode three additional settings are added under the Setup menu. These new settings are listed first in the menu. Each press of the Setup button will present each of these settings in the following sequence.

These settings are followed in the Setup menu by the four settings already described under Setup Automatic mode (Limit, Tolerance, Critical Vibration, Critical RPM).

	Balance Type. Each type describes the method of balancing weight attachment to be used on the machine to perform balancing. Single Weight – One single weight of variable mass is positioned at a variable angle position. 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.
	If Fixed Positions is selected, then the following screen is displayed and allows for editing the number of fixed positions from 3 to 99. The positions are assumed to be evenly spaced in a 360 degree pattern. They must be labeled on the machine from 1 to the highest number available, in order to identify the positions during balancing.
 	Scale Direction. 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 (clockwise or counterclockwise when facing the scale) in which the angle references (0°, 90°, 180° etc.) or the weight position location numbers (1,2,3,4, etc.) increase. The system must know if this direction is the same as, or opposite to, the wheel's direction of rotation. The top image shows the selection where the weight scale and spindle rotation are in the same direction. The bottom image shows the selection where the weight scale and spindle rotation are in the opposite direction.

Manual Balance Overview

Important - Performing a Manual 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.

Press Balance to start a complete Manual Balance operation. There are three phases for each balancing cycle:

- **Zero** phase. The vibration level is measured and saved.
- **Test** phase. The test weight is measured so its effect can be calculated.
- **Solution** phase. The balancing solution is given. The **Trim** phase is just an iteration of the Solution Phase, performed if more adjustment is needed.

Four Parts of Each Phase:

1. Stop spindle. The control indicates that the spindle needs to stop.
2. Apply weights. Once stopped the operator must adjust the weights.
3. Start Spindle. The spindle must be started.
4. Measure. The vibration can be measured for calculating the next phase.

Information is not 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 Phase

The first two phases of the balance cycle (Zero and Test) allow the SB-1000 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 Zero and Test phases will produce inaccurate results.

Trim phase balancing can be performed at any time that vibration levels rise above a satisfactory balance condition. Press Manual to start a Trim Balance operation. This skips the Zero and Test phases of the operation and starts at the Solution phase. To do this the SB-1000 must have saved results from a previously completed Zero phase and Test phase. If the Manual button is pressed when these two phases have not been completed, then the FPI indication will display for 1.5 second, and the Solutions screen will not be displayed.

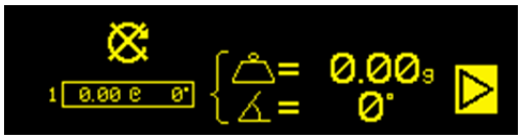
Balancing Problems - If successive Trim balance attempts are unsuccessful, this is an indication that either machine conditions have changed, or an error has occurred in weight placement (inaccurate position(s) or mass changes). In this case the operator should verify the Scale Direction setting is still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

Three sections follow to describe the operation of the different balancing types.

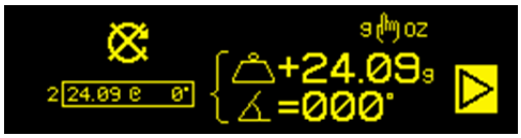
Single Point Manual Balance

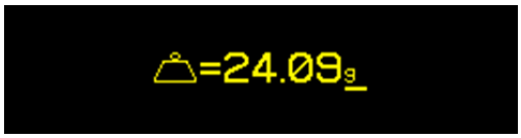
1) Stop Spindle - This screen requests the operator to stop the spindle. The Stop Spindle icon flashes as a reminder. This screen stays until the control detects that the spindle rotation has stopped.

2a) Apply Weights, **Zero Phase** - Once the spindle is stopped, this screen shows the operator how to place the weight. During the Zero Phase the weight should be removed.



2b) Apply Weights, **Test Phase** - The test weight must be added (+) at zero position. The value of the test weight is shown.

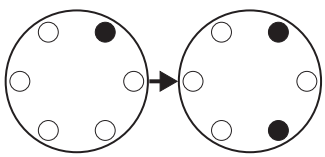


	During the Test Phase pressing Manual (note g oz icon) will display this screen, allowing the test weight value to be edited. The weight units can also be selected from g, oz, lb, kg, and nothing. It is essential to enter an accurate value for the test weight. When done editing press to save changes and return to the Apply Weights screen above.

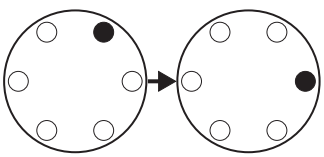
2c) Apply Weights, **Solution Phase** - The weight should be changed to the position and mass shown to bring the balance to a minimum.

Weight change display can be either additive (+) or absolute (=). Press Manual button to toggle between these options (note + = icon). This selection will remain active until changed. Additive weight display (+) shows what incremental changes should be made to achieve balance, with all previously placed weights on the grinder remaining in place. Absolute weight display (=) shows what total weight should be applied to achieve balance, assuming all previously placed weights will be removed.

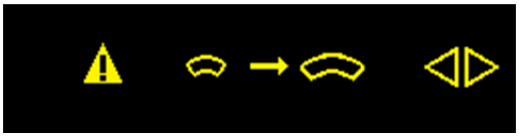
Additive Weight Change

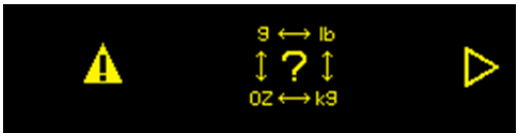


Absolute Weight Change



Additional iterations of the Solution phase (Trim Phase) can be performed if the balance solution is unsatisfactory. The box on the left side of the screen contains the equivalent single point total balance solution. The digit to the left of the box indicates the phase (1-Zero, 2-Test, 3=Solution, 4 or higher=Trim). The higher this number gets, the more Trim balance operations have been performed since the last determination of a correct Zero and Test phase.





It is possible at the Solution Phase that a balance solution is difficult to achieve, at which time one of these screens may be displayed instead of the Solution screen.

The top image indicates that bigger weights should be used. Press ◁ button to return to Apply Weights screen for an opportunity to use a larger weight and repeat the Test phase.

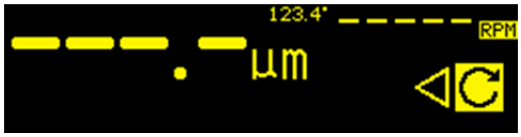
The bottom image indicates that the compensation numbers are very large or small for accurate display and the weight units in use may need to change.

Press ▷ button to return to the Apply Weights screen without making any changes.

If changes are made, a new complete balance operation should be run by pressing T.

Pressing ▷ will advance to the next step in the phase, the Start Spindle screen. The ▷ symbol flashes as a reminder. Starting the spindle will also advance to the next screen.

3) Start Spindle – This screen requests the operator to start the spindle. 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 ◁ symbol indicates that the weight locations will be displayed for review by pressing the ◁ button (will go back to Apply Weights screen).

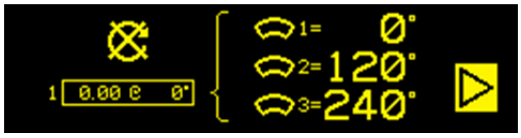


4) Measure – The control measures the new vibration level. The operator should wait for the RPM and vibration to stabilize then press ▷ button to advance to the next screen. The ▷ symbol flashes as a reminder. If the balance level is below the Limit, then the balance process is complete and the next screen displayed is the Main screen. Otherwise the control will advance to the Stop Spindle screen of the next phase. Press ◁ button to back up and show the Apply Weights screens in order to review the last weight changes.

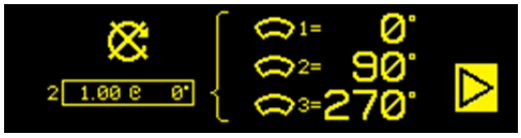
2 and 3 Weight Manual Balance

1) 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.

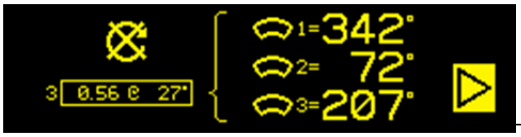
2a) Apply Weights, **Zero Phase** - Once the spindle is stopped, this screen shows the operator how to place the weight. During the Zero Phase the weights must be removed or moved to the null position as shown.



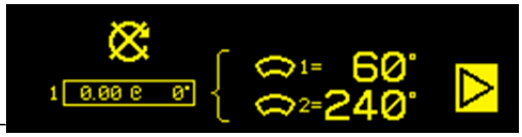
2b) Apply Weights, **Test Phase** - During the Test Phase the weights are moved to a location where the effect of one weight can be measured.



2c) Apply Weights, **Solution Phase** - The weight positions should be changed as shown to bring the balance to a minimum. Both the three weight and 2 weights screens are shown following. Extra iterations of this phase (called Trim Phase) may be required. Pressing ▷ will advance to the next part of the phase, the Start Spindle screen. The ▷ symbol flashes as a reminder. Starting the spindle will also advance to the next screen.



—or—



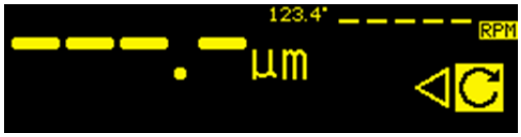
It is possible at the Solution Phases that a balance solution is difficult to achieve, at which time one of these screens may be displayed instead of the Solution screen.

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.

If changes are made, a new complete balance operation should be run by pressing T.

3) Start Spindle – This screen requests the operator to start the spindle. 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 ◁ symbol indicates that the weight locations will be displayed for review by pressing the ◁ button (go back to Apply Weights screen).

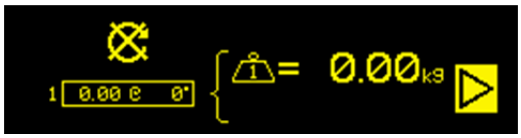


4) Measure – The control measures the new vibration level. The operator should wait for the RPM and vibration to stabilize then press ▷ button to advance to the next screen. The ▷ symbol flashes as a reminder. If the balance level is below the Limit, then the balance process is complete and the next screen displayed is the main screen. Otherwise the control will advance to the Stop Spindle screen of the next phase. Press ◁ button to back up and show the Apply Weights screens in order to review the last weight changes.

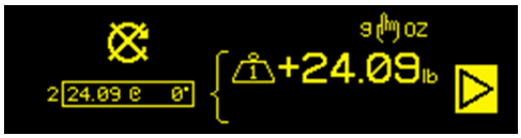
Fixed Position Manual Balance

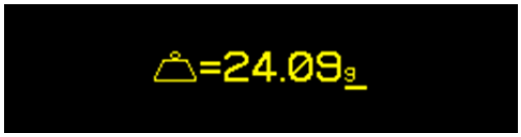
1) Stop Spindle - This screen requests the operator to stop the spindle. The Stop Spindle icon flashes as a reminder. This screen stays until the control detects that the spindle rotation has stopped.

2a) Apply Weights, **Zero Phase** - Once the spindle is stopped, this screen shows the operator how to place the weight. During the Zero Phase the weights must be removed.



2b) Apply Weights, **Test Phase** - During the Test Phase a test weight must be added (+) at position 1. The number inside the Weight icon shows the position number where weight is to be added. The value of the test weight is shown.

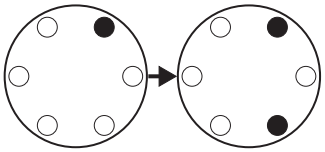


	During the Test Phase pressing Manual (note g oz icon) will display this screen, allowing the test weight value to be edited. The weight units can also be selected from g, oz, lb, kg, and nothing. It is essential to enter an accurate value for the test weight. When done editing press to save changes and return to the Apply Weights screen above.

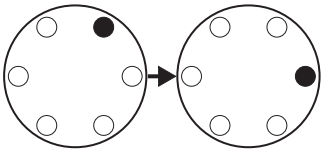
2c) Apply Weights, **Solution Phase** - The weight positions and masses should be changed as shown to bring the balance to a minimum.

Weight change display can be either additive (+) or absolute (=). Press Manual button to toggle between these options (note + = icon). This selection will remain active until changed. Additive weight display (+) shows what weight changes should be made to achieve balance, with all previously placed weights on the grinder remaining in place. Absolute weight display (=) shows what weight changes should be made to achieve balance, assuming all previously placed weights will be removed.

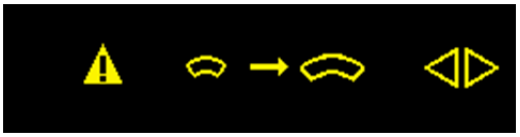
Additive Weight Change

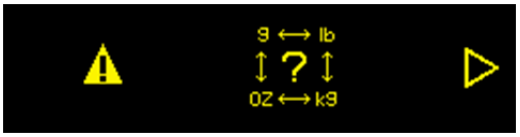


Absolute Weight Change



Additional iterations of the Solution phase (Trim Phase) can be performed if the balance solution is unsatisfactory. The box on the left side of the screen contains the equivalent single point total balance solution. The digit to the left of the box indicates the phase (1-Zero, 2-Test, 3=Solution, 4 or higher=Trim). The higher this number gets, the more Trim balance operations have been performed since the last determination of a correct Zero and Test phase.





It is possible at the Solution Phases that a balance solution is difficult to achieve, at which time one of these screens may be displayed instead of the Solution screen.

The top image indicates that bigger weights should be used. Press ◁ button to return to Apply Weights screen for an opportunity to use a larger weight.

The bottom image indicates that the compensation numbers are too large or too small for accurate display and the units may need to change.

Press ▷ button to return to the Apply Weights screen without making any changes.

If changes are made, a new complete balance operation should be run by pressing T.

Pressing ▷ will advance to the next part of the phase, the Start Spindle screen. The ▷ symbol flashes as a reminder. Starting the spindle will also advance to next screen.

3) Start Spindle – This screen requests the operator to start the spindle. 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 ◁ symbol indicates that the weight locations will be displayed for review by pressing the ◁ button (go back to Apply Weights screen).

4) Measure – The control measures the new vibration level. The operator should wait for the RPM and vibration to stabilize then press ▷ button to advance to the next screen. The ▷ symbol flashes as a reminder. If the balance level is below the Limit, then the balance process is complete and the next screen displayed is the main screen. Otherwise the control will advance to the Stop Spindle screen of the next phase. Press ◁ button to back up and show the Apply Weights screens in order to review the last weight changes.

Hardwire Interface

Interfacing the SB-1000 with a CNC or PLC machine controller is supported via a hardwire interface. The hardwire interface is provided via a standard DB-25 connector located on the rear panel. 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 SB-1000 with any machine controller.

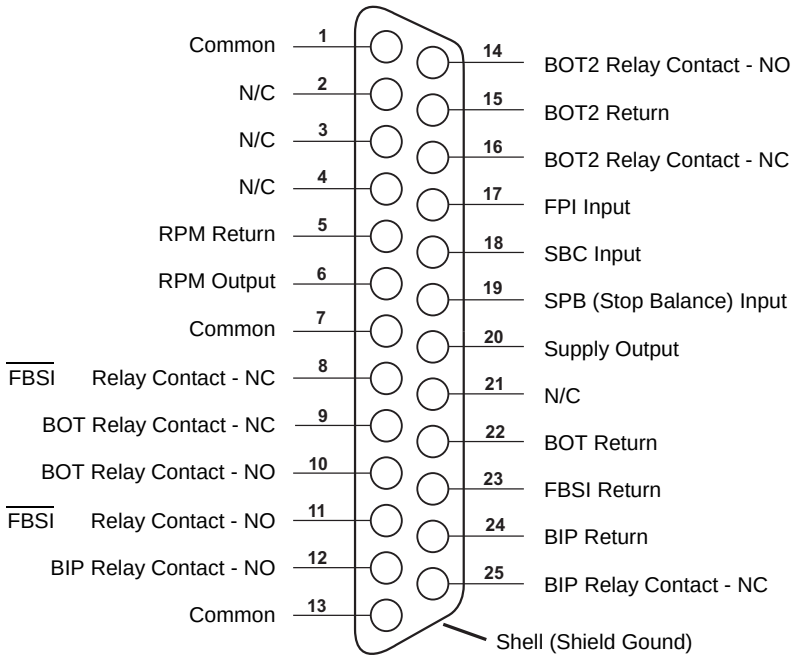
Hardwire Interface Overview

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 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-1000 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-1000 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.

Hardwire Interface Connector
Standard for all SB-1000 models



The four primary outputs consist of optically isolated, solid state, single-pole/double-throw relays. These relays may be used to supply an output signal by connection to a voltage source supplied by the customer.

The relay 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/double-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.

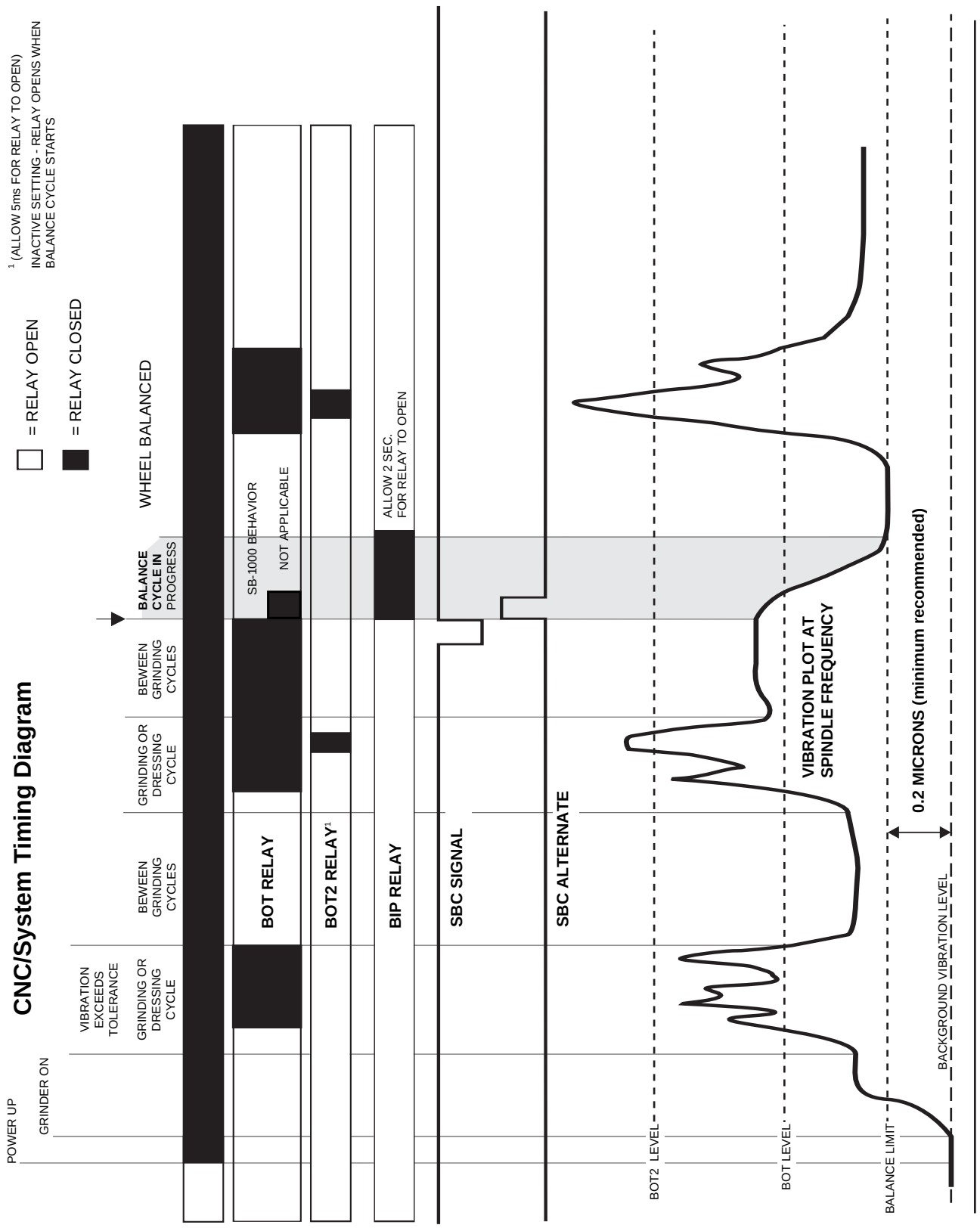
Input Pin Names and Functions

Pin#	Name	Description
18	**SBC**	Start Balance Command- Momentarily activated to initiate an automatic balance operation. The rising edge of this signal starts the operation.
19	**SPB**	Stop Balance Command- When active, this input stops an automatic balance operation in progress and inhibits the start of an automatic balance operation from the hardwire interface. AUTO button is still functional on front panel.
17	**FPI**	Front Panel Inhibit- When active, key operator actions at the front panel keypad are disallowed. The MENU, MAN., and the AUTO Button are disabled. Still enabled are the Power button and the Cancel button, which can be used to stop an automatic balance operation. Access to the SHOW-ALL button and System Status screen are a llowed.

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 relay is energized when the sensed vibration level exceeds the operator defined Tolerance.
15 14 16	**BOT2-R** **BOT2-NO** **BOT2-NC**	Balance Out of Tolerance Two: Return, normally open, and normally closed contacts. This relay is energized when the sensed vibration level exceeds the operator defined Critical Tolerance, or when the spindle RPM exceeds the operator defined Critical RPM.
24 12 25	**BIP-R** **BIP-NO** **BIP-NC**	Balance In Progress: Return, Normally Open, and Normally Closed contacts. This relay is energized while an automatic balance operation is in progress.
23 11 8	**/FBSI-R** **/FBSI-NO** **/FBSI-NC**	Failed Balance/ System Inoperative: Return, normally open, and normally closed contacts. This relay is energized after a successful Power On Self-Test, when the power is disconnected, or when the control is in stand-by. It is de-energized if a fault condition arises.
6 5	**RPM** **RPM-R**	This relay closes once per revolution for a minimum of 1ms. This is a buffered output of the RPM signal generated by the balancer. It is not available if the RPM has been entered manually.

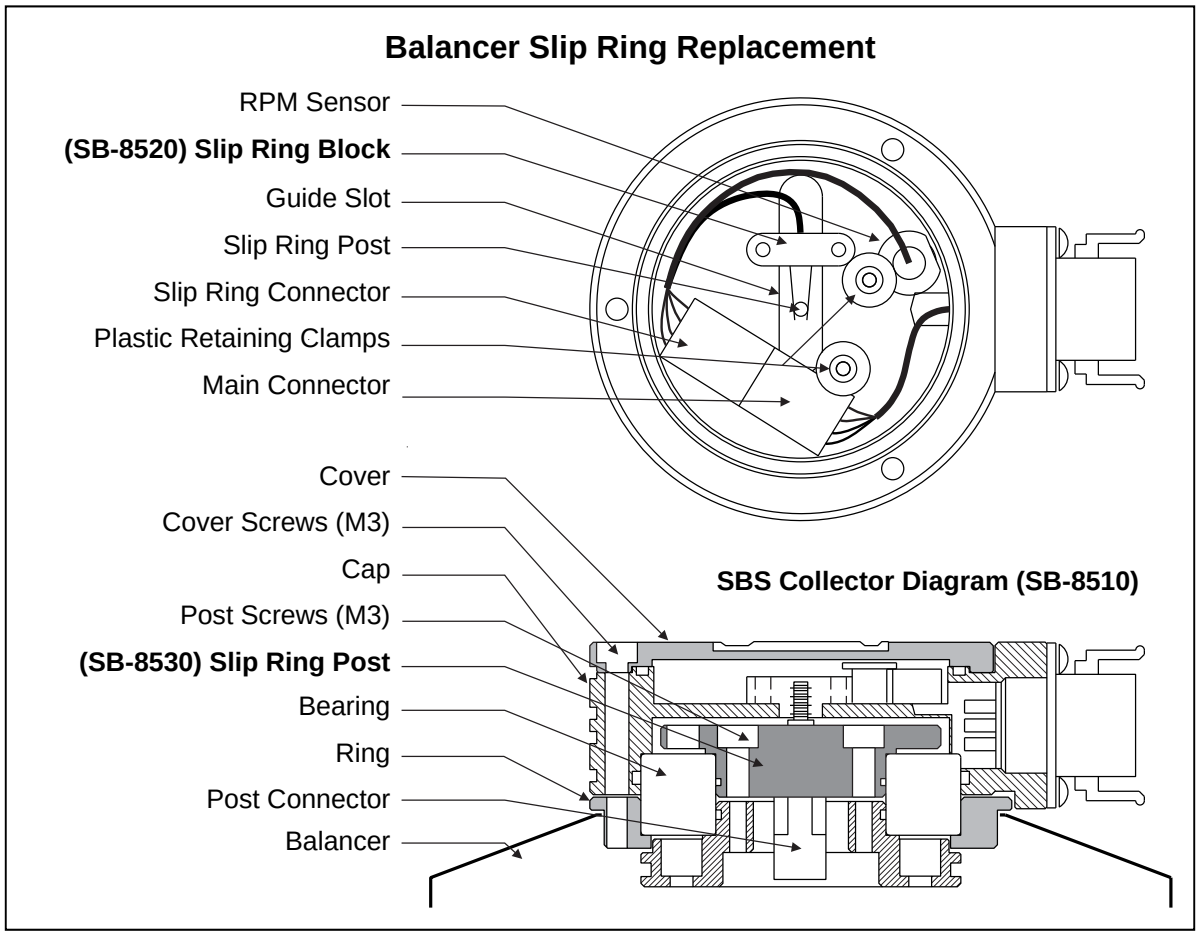
CNC/System Timing Diagram



System Maintenance

Collector Maintenance

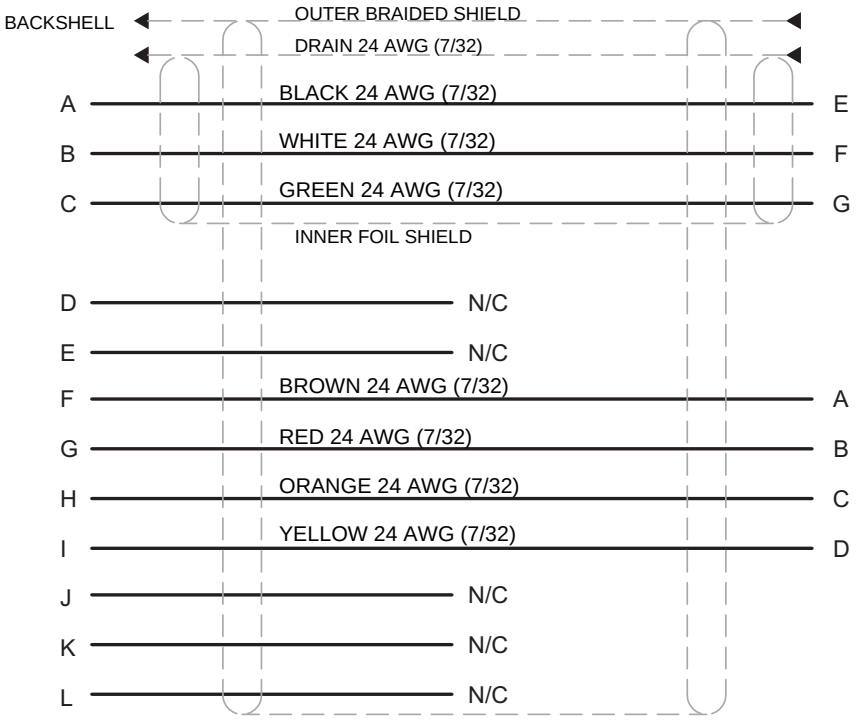
Operator maintenance of the SBS Balance System is restricted to replacement of the Balancer slip ring assembly as necessary. Instructions are shipped with the collector replacement parts. Cable schematics for the Balancer Cable and Sensor Cable follow in order to assist with minor repair or wiring connection work. If further service is required, contact your SBS Balance System source, or Schmitt Industries Inc.

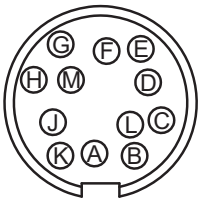


SBS Return/Repair Policy

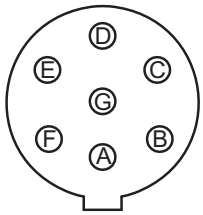
Schmitt Industries' policy is to give highest priority to the service needs of our customers. We recognize the cost of machine downtime, and strive to deliver same day repair of items arriving by overnight delivery at our facility. Because of the complication and delays involved with international shipments, 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 Schmitt Industries, Inc. for a Return Materials Authorization (RMA) number. Without this tracking number, Schmitt Industries cannot ensure prompt and accurate completion of your repair needs. Failure to obtain an RMA number may result in substantial delay.

Balancer Cable (SB-48xx/SB-48xx-V)



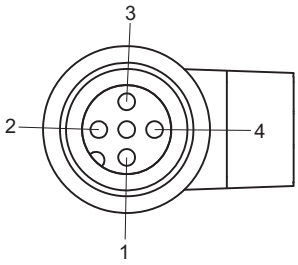


Control End
12p Circular Male DIN
Pin View

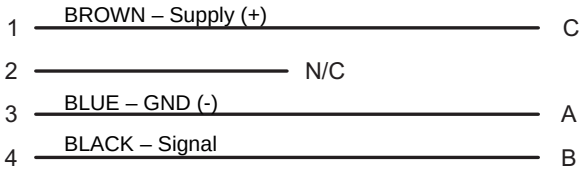


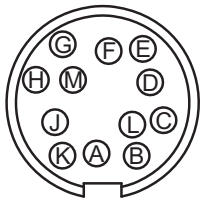
Balancer End
7p Bayonet Female
Pin View

RPM Sensor (SB-1816)



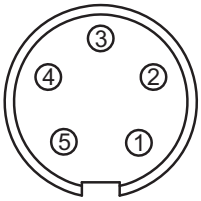
RPM Sensor End
M12 Pin View



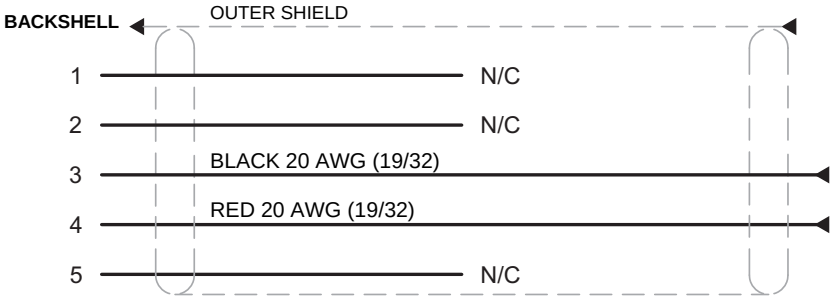


Control End
12p Circular Male DIN
Pin View

Vibration Sensor (SB-14xx)



Control End
5p Circular Male DIN
Pin View



Trouble Shooting Guide

This guide is designed to help you if you experience problems with your SBS Balance System.

If the Power-On screen appears during an Auto Balance operation, the power supply to the SB-1000 is likely below the required amperage specification.

Step 1 ERROR MESSAGES. If the balance Control Unit is displaying any error messages, refer to the Error Indications section of this manual for explanation of the message(s) displayed. Contact Schmitt Industries for assistance as required. **If reporting a service issue, please indicate the Error Code (letter) of any displayed Errors.**

Step 2 VIBRATION SENSOR. If no error messages are displayed, check the Vibration Sensor. Verify that the Sensor is firmly seated on the machine, its magnet 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)*.

As a final check, set the RPM manually on the Control Unit to the operating speed of the grinder, and verify that there is an incoming vibration signal. To perform this Test the SB-1000 must be set to Automatic Balance mode, and then press the button to set the RPM. If you receive a near zero reading from the Sensor after manually setting the RPM, the Vibration Sensor and Control Unit should be returned for repair. Contact Schmitt Industries for a return materials authorization (RMA) number.

Step 3 BALANCER (Automatic Balance mode only). If the Vibration Sensor is working correctly, the next step is to perform an integrity check of the rest of the system. This test should be performed with the machine running, but not during a grinding or dressing cycle. Press the MAN. button to enter the manual control mode, and simply press each of the four manual buttons, one at a time, for a period of about 5 seconds. With each movement of the Balancer weights, the SB-1000 should register a change in the displayed vibration level on the Control Unit. If this does not happen for any of the four buttons, there is a service problem with the system. The Balancer, SB-1000, Vibration Sensor, and Balancer Cable should all be returned as a unit. Contact Schmitt Industries for a return materials authorization (RMA) number.

Step 4 If the control unit's self-check shows no service problem with the SB-1000, 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: Environmental Considerations section)* The sizing of the Balancer to the application should also be checked. *(see: Verifying Balancer Sizing section)*

If you continue to have problems after following these four steps, contact Schmitt Industries, or your SBS Balance System source for assistance.

Error Indications

The ⊠ screen icon is displayed when the error can be hidden manually by pressing the ⊠ button. The Error screen icon blinks for emphasis on these error screens.

Error Code	Message	Description
A		Checked continuously. Clears automatically. RPM signal present but out of operating range (300 to 30000).
B		Checked continuously. Clears automatically. **Vibration** sensor is **open**, unplugged, or faulty.
C		Checked continuously. Clears automatically. **Vibration** sensor is **shorted** or faulty.
D		Checked at the end of Automatic mode balance weight motion. Clears automatically. **Balancer** motor and/or cable has a **short** circuit.
E		Checked at the end of Automatic mode balance weight motion. Clears manually. **Balancer** motor and/or cable is **open** or unplugged.
F		Checked at the end of Automatic mode balance weight motion. Clears manually. Balancer motor **excess current**.
G		Checked at power-up. Checksum Error. Recommend flash update.
H		Checked continuously. Low +15V supply to RPM sensor and CNC connector. Check sensor and/or cable for short circuit. Check CNC connections for short circuit.
I		Automatic Balance cycle failed to reach limit. Cleared manually. Try higher Limit. Balancer may be incorrectly sized.
J		Checked during a balance cycle. Clears automatically. RPM signal is missing. Spindle may not be turning. Balancer and/or cable may be unplugged or faulty.

Error Code	Message	Description
K		Checked at the end of Automatic mode balance cycle. Cleared manually. Abnormal Auto Balance cycle. Occurs when a balance cycle finishes, but an error occurred and was cleared during the cycle.
L		Checked continuously. Clears automatically. Unable to measure vibration. Control may need repair.
M		Checked at power-up. Does not clear. Controller has older logic. Recommend factory update.
N		Checked at power-up. Does not clear. Controller has logic problem. Recommend factory repair.

Factory defaults

Holding the button down during power-up resets all configurations back to factory defaults. To confirm the default action, the display will show the screen icon until the button is released. This action is not allowed if the FPI input is active on the CNC hardwire interface.

Factory default settings are as follows:

Limit (0.40)
Tolerance (1.20)
Critical (20.00)
Critical RPM (OFF)
Manual RPM (500)
Mode (Auto Balance)
Scale Direction (Same)
Manual Balance Type (2 weight)
Fixed Positions (4)
Test Weight (0.1)
Weight Units (g)
Additive/Absolute Weight Display Mode (+)

Appendix A: Specifications

Physical Features

Display
Type: Yellow monochrome OLED
Active area: 256H x 64V pixel
3.11 inch [79mm] x 0.75 inch [19mm]

Communication Interfaces
CNC/PLC Hardwire Interface (opto-isolated outputs)

DC Supply: Input 22 VDC to 26 VDC.

Automatic Balance mode - 3.5A max at 22 VDC.

Manual Balance mode - 0.5A max at 22 VDC.

Reverse voltage protected.

Power Connector: Phoenix 1803578 or equiv.

RPM Sensor:

Environmental and Installation

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

Appendix B: Replacement Parts List

Part#	Description
Balancer/ RPM Sensor Cables	
SB-1800	RPM Proximity Sensor
SB-1816	RPM Sensor Cable – 5m/ 16ft
SB-1916	RPM Sensor Extension Cable – 5m/ 16ft
SB-1932	RPM Sensor Extension Cable – 10m/ 32ft
SB-48xx	Balancer Cable /SB-5500 series
SB-48xx-V	Balancer Cable /SB-5500 series – Heavy Duty
SB-46xx	Balancer Extension Cable /SB-5500 series
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)
Vibration Sensors	
SB-14xx	Sensor Cable (standard lengths)
SB-16xx	Sensor Ext. Cable (standard lengths)
Control 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-5005	Keypad Mount: Flush Panel Frame Kit
SB-24xx-L	Hardwire Interface cable (standard lengths)
Other Parts	
SB-8510-V	Complete Heavy-Duty SBS Balancer Low Profile Collector replacement
SB-8520	Collector Slip Ring Block Replacement
SB-8530	Collector Slip Ring Post Replacement
SB-1300	Adjustable Hook Pin Spanner (Adapter Flanges)
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]