ACCRETECH | SBS
PRECISION PROCESS CONTROL

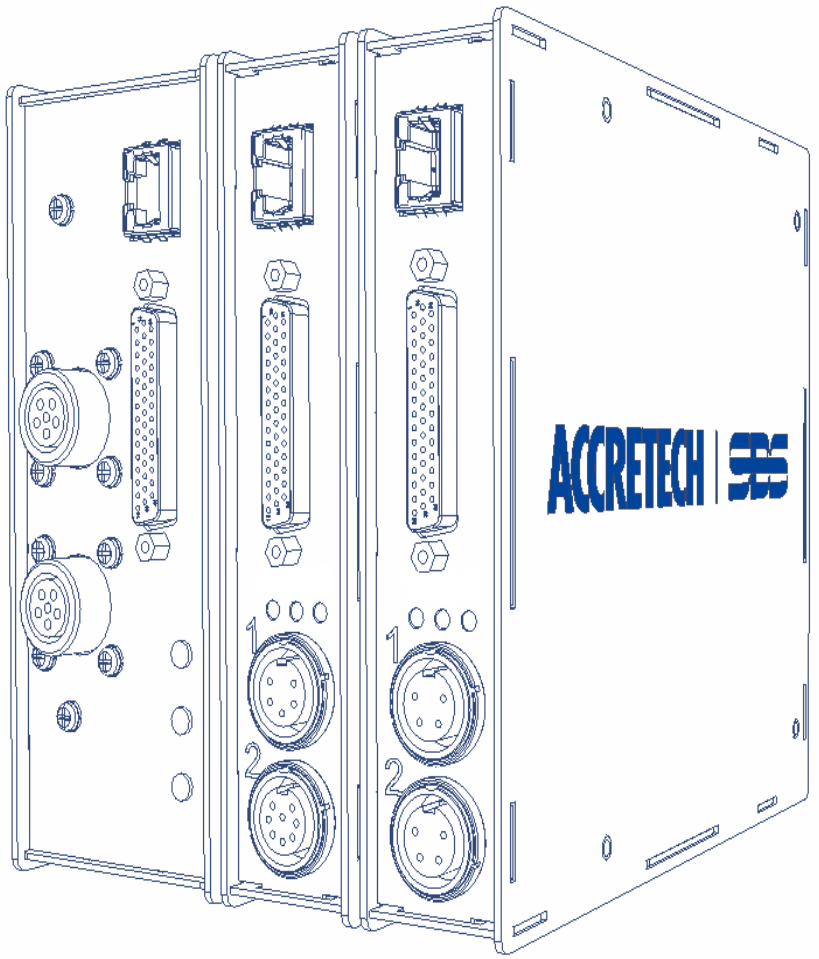
OPERATIONS MANUAL

SB-6518
SB-6532

SB 6500

Intelligent Process Balancing System

Engineering Confidence for Precision Grinding



ENGINEERING CONFIDENCE.
BUILT WORLDWIDE.

DOCUMENT NUMBER
LL-6100

MANUAL REVISION
1.4

SOFTWARE VERSION
1.21.2

PUBLICATION DATE
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accretechsbs.com

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User's Guide and Specification

For the

SBS Balance System

Covering Operation of SB-6518 and SB-6532

of Model 6500 series Control Units

LL-6100

Manual Revision # 1.4

Covers operation with product firmware rev 1.21.2

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Benefits of SBS Balancer System with SB-6500 Control:

- 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 bearings
- Easy to install and operate
- **Works with existing SBS installations**
- Profinet and OPC UA communication
- International adaptability: voltage, frequency, communication, and display language
- Backed by world-class SBS customer service

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1 General Instructions

1.1 System Purpose

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**
- **Minimal Maintenance Requirements**
- **Attractive Purchase Price**

1.2 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 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 Balance System or AEMS sensor components to the grinding machine spindle, including the proper use of provided adapter lock screws, will result in safety hazard during machine operation.

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

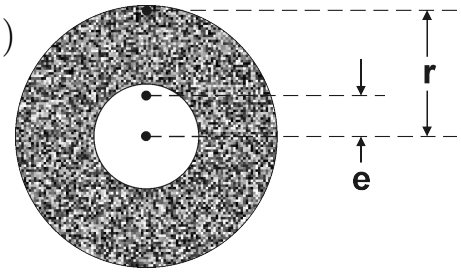
Caution: To avoid equipment damage, make sure the line voltage is within the range specified for the system (see specification section).

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

1.3 System Theory

Intrinsic Imbalance $= e\,(\text{Wheel Mass})$

Measured Imbalance $= r\,(\text{Balance Weight})$



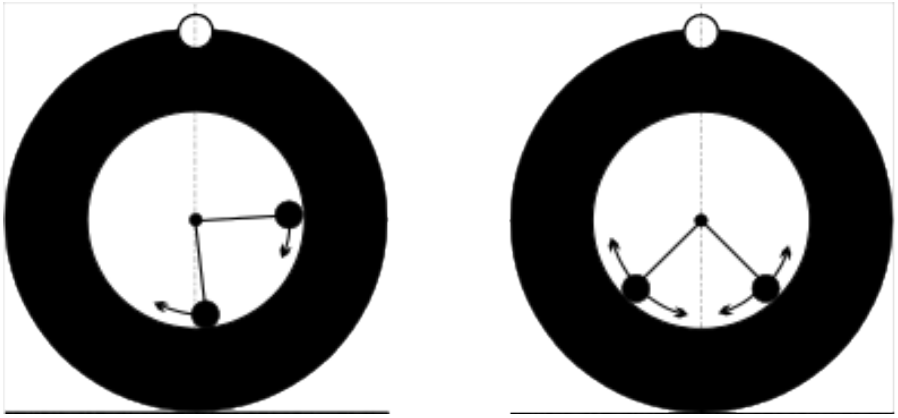
r = Center Rotation to Balance Mass

e = Center Rotation to Wheel Center of Mass

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.

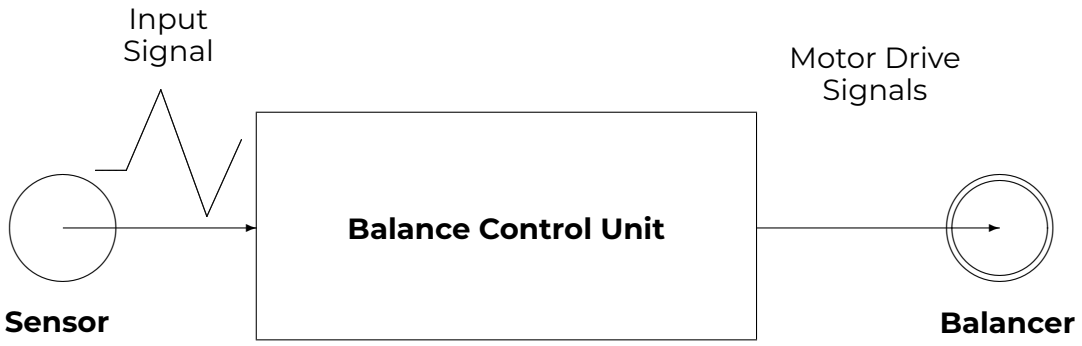
The imbalance of a grinding wheel is determined in practice by use of the Measured Imbalance of the wheel. The Measured Imbalance is equal to the product of the mass of an attached balance weight, located to balance the grinding wheel, multiplied by "**r**" the distance between that weight's center of 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.

1.4 Automatic Balance Overview



Unbalanced **Balanced**

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



The balance cycle is complete when the balance weights are positioned so that minimum vibration is achieved. The above figures show an unbalanced rotating grinding wheel, with an SBS Balance System installed. The imbalance is represented by the white dot located on the circumference of the wheel. 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.

The system consists of the Balancer, a Balancer Cable, a Vibration Sensor, and the SBS microprocessor-based Control Unit. 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. 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.

1.5 Manual Balance Overview

The SBS Balance System control can be used as an aid in performing manual balance operations, where the use of a fully automatic system is not warranted, or to assist with pre-balancing a new grinding wheel. In some applications (especially for large wheels), the Balancer may not have enough correction capacity to balance a new wheel with extreme imbalance. In such cases, the SBS Balance system can aid in positioning manual balancing weights to compensate for the majority of the wheel's imbalance. Automatic balancing can then be used to provide balance control until the next wheel change.

An RPM sensor is used to monitor the RPM and phase angle of vibration of the rotating spindle. An RPM sensor with a fixed position trigger point must be used to allow the phase position of the spindle to be determined.

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

1.6 Environmental Considerations

The SBS Balance System 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.

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

1.6.2 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.

1.6.3 Background vibration

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

Mount the Vibration Sensor in the position to be used during operation *(see: Vibration Sensor Location section)*. Install the Balancer, Control, and all cables as indicated in the installation section of the manual before powering on the Control. Leave the grinding machine off and manually set the control to 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.

1.6.4 Verifying automatic balancer sizing

After performing a balance cycle to reduce the machine vibration to a low level, use the manual motor buttons to 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. 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.

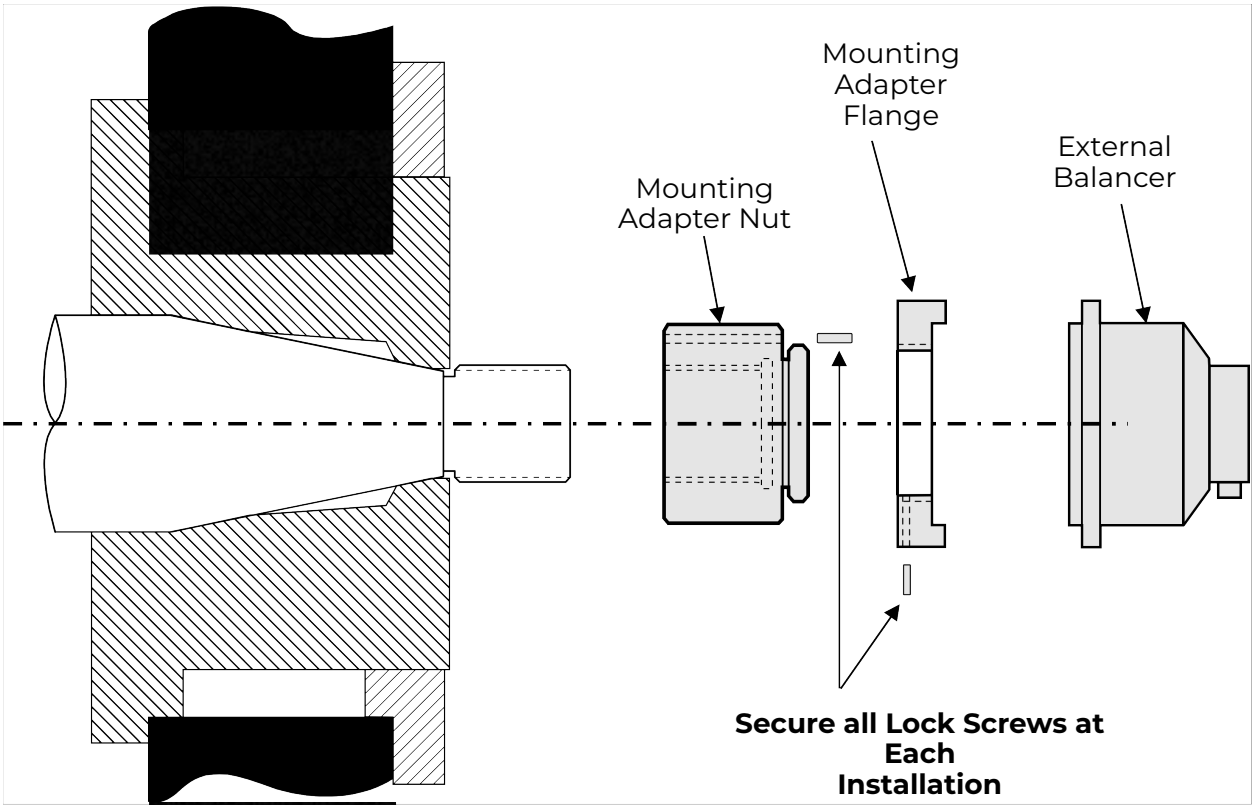
1.7 System Installation

1.7.1 External balancer and adapter

The Balancer is mounted to the machine spindle with the provided adapter. The mounting adapter is specifically designed to accommodate a particular machine's spindle configuration and can vary in design. In general, the adapter consists of two parts. The **Adapter 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 **Adapter Flange** bolts to the Balancer, and threads onto the installed Adapter 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.

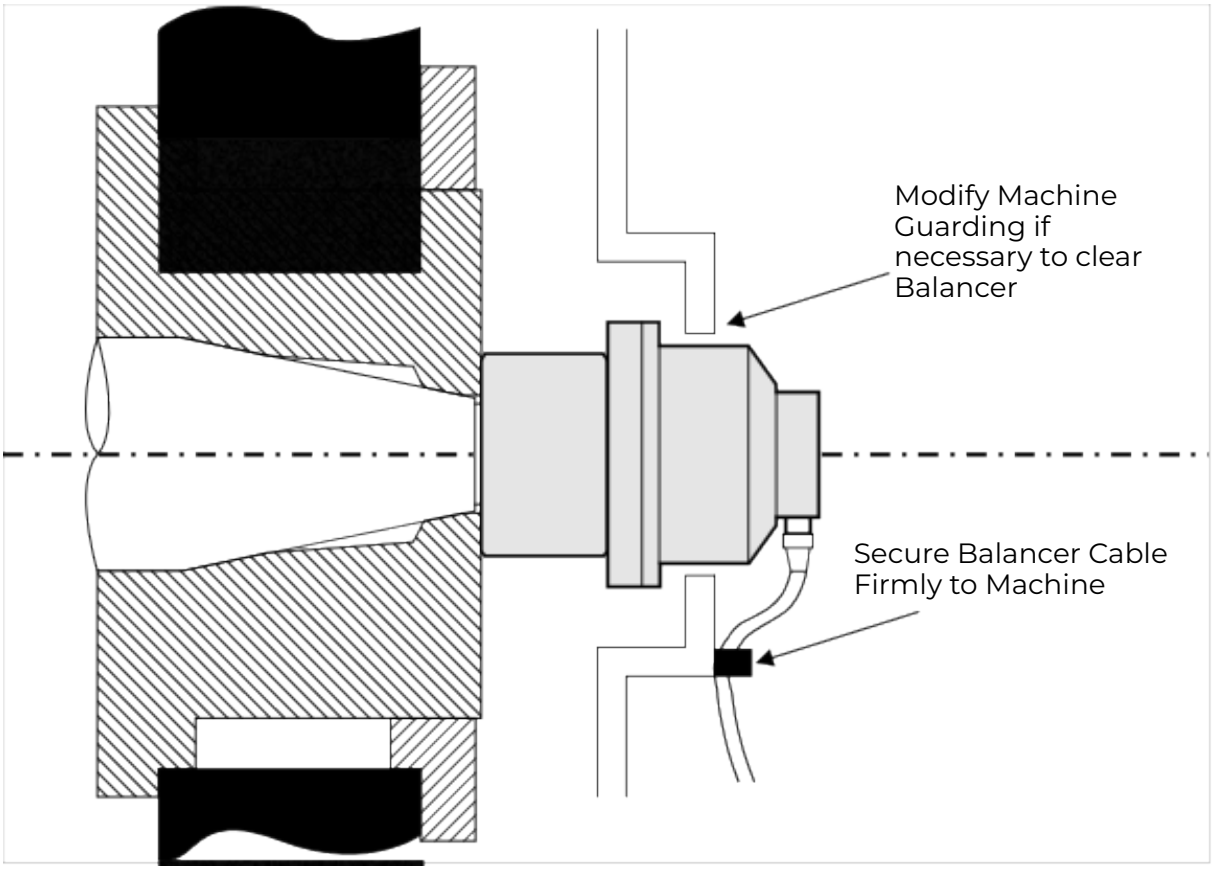
Lock Screws are a feature of many adapter designs, where required by high machine speeds or machine spindle braking. These consist of M6 set screws in the face of the Adapter Nut, and M5 socket set screws in the outer diameter of the Adapter Flange. These lock screws should be loosened prior to adapter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

Warning!! - All lock screws must be properly secured each time the Adapter Nut or Adapter Flange is installed to prevent 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).



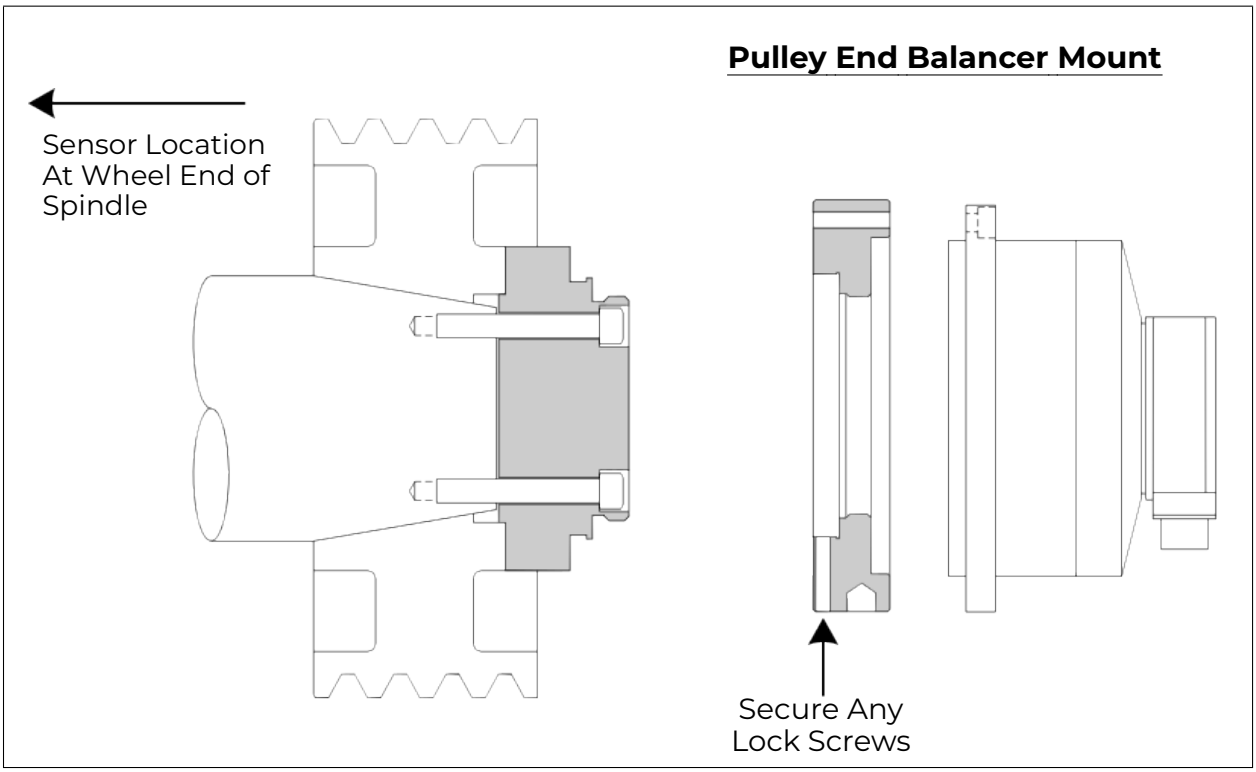
Follow this assembly procedure to ensure proper mounting of Adapter Nuts and Flanges where lock screws are part of the adapter design:

1. Loosen all lock screws before assembly. The engagement end of these screws should be below flush with the face of the adapter/flange where they exit.
2. Screw the Adapter 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 Adapter Nut wrench tight.
4. Thread the Balancer/adapter flange assembly onto the mating threads on the Adapter Nut.
5. Tighten the lock screws in the Adapter 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 upon installation. Make sure there is no interference between the Balancer/adapter assembly and any part of the machine (e.g. work head, tailstock), especially with the wheel worn to 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.

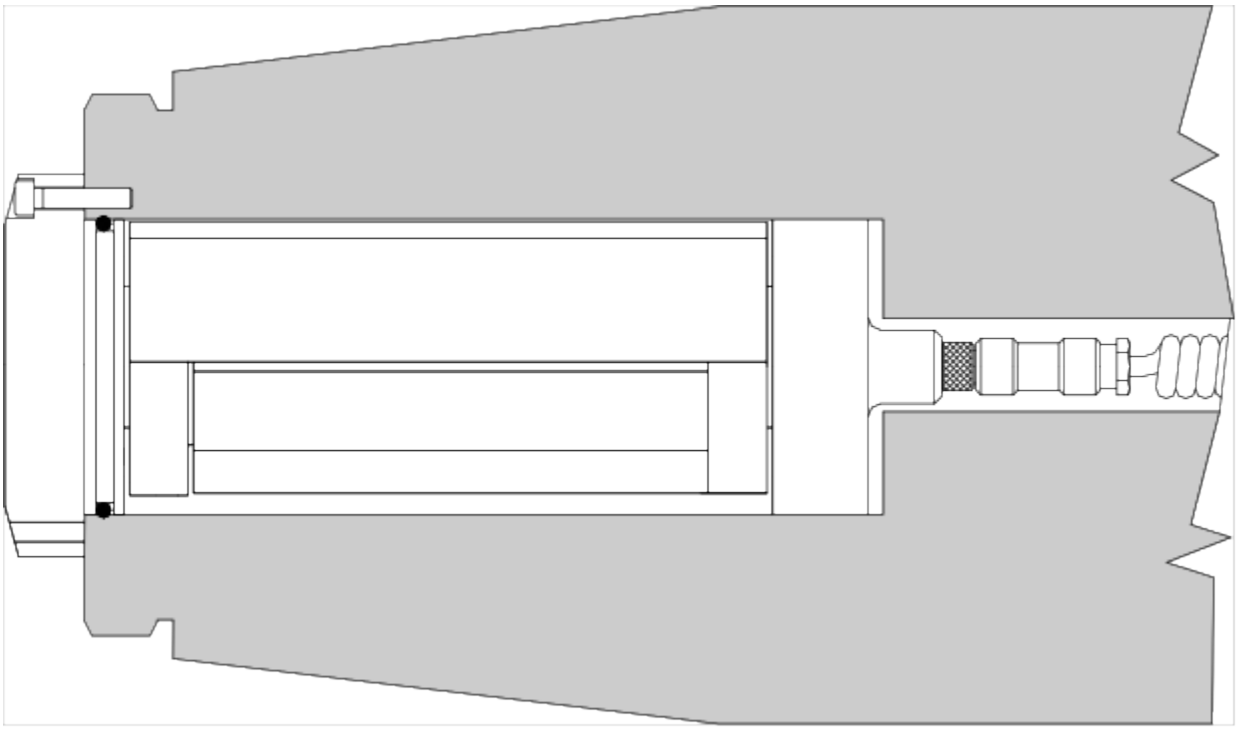
The Balancer Cable should be restrained to prevent the cable from being caught up in the rotating machine but should allow for the cable's removal as necessary during wheel changes. Optimally, the cable should be secured so that the connector on the Balancer points down, as shown in the diagram. This 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 each re-connection to prevent premature connector failure. SBS recommends the use of an electrical contact spray lubricant for this purpose.

Previous installation drawings show the standard balancer version with cable connection direct to balancer (SBS slip ring collector), mounted on the wheel end of the grinder spindle. Other balancer installation options are available including mounting External Balancers to the pulley or drive end of the spindle (where machine construction permits). Internal Balancers are available that mount inside an OEM supplied bore inside the spindle. The SBS Non-Contact collector can also be used to eliminate direct cable connection to the balancer.

1.7.2 Internal balancers



Internal Balancers are designed for mounting inside or internal to the machine spindle. The machine manufacturer must provide a precision-machined mounting bore as part of the design of the grinder's spindle to accept an internal balancer. The 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 is cabled to the SBS Rotor, which is mounted separately at the rear end of the spindle. With other versions of the balancer, the Rotor 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. Both the standard cabled collector and the SBS non-contact collector are available options with internal balancers.

1.7.3 Non-contact balancers

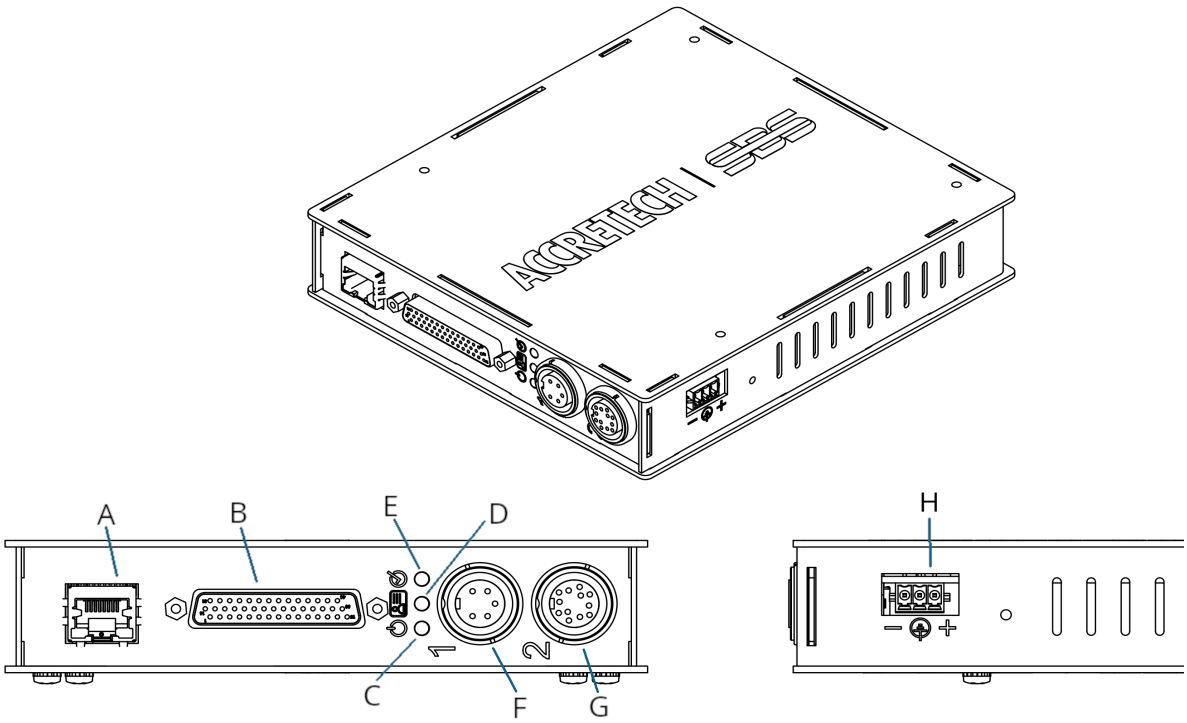
The Non-Contact (N/C) system can be used with both External and Internal Balancers. N/C Balancers require the use of the non-contact SBS Module (SB-6532). The non-contact system consists of two parts, the Rotor and the Stator. The Rotor is mounted to a balancer and normally ordered as part of the balancer. N/C Balancers are available with or without a built-in AE sensor. Non-Contact External Balancers are designated by a –N suffix on the part number, while the same balancer with a built-in AEMS sensor is designated with a –J.

1.7.4 Non-contact Stators

The Balancer must be paired with a matching type of Stator for proper operation. The size and shape, and mounting requirements can vary with the application. Consult the specific product drawing for mounting requirements.

1.7.5 Control Unit

The front and bottom of the SBS control module is shown below. The two circular connectors allow for the attachment of the balancer and vibration sensor.



SB-6518 Balancer Shown

A) Ethernet. Provides TCP/IP and UDP connection to host device, such as SB-6500 software or OPC UA server.

B) Hardwire I/O. DB-44 connector.

C) LED-Red. On when device is supplied power.

D) LED-Yellow. Device ID. Normally off. Flashes as directed by operator.

E) LED-Green. On when module is fully operational.

F) Vibration Sensor connection.

G) Balancer connection.

H) Power supply, DC input. 22 VDC to 26 VDC.

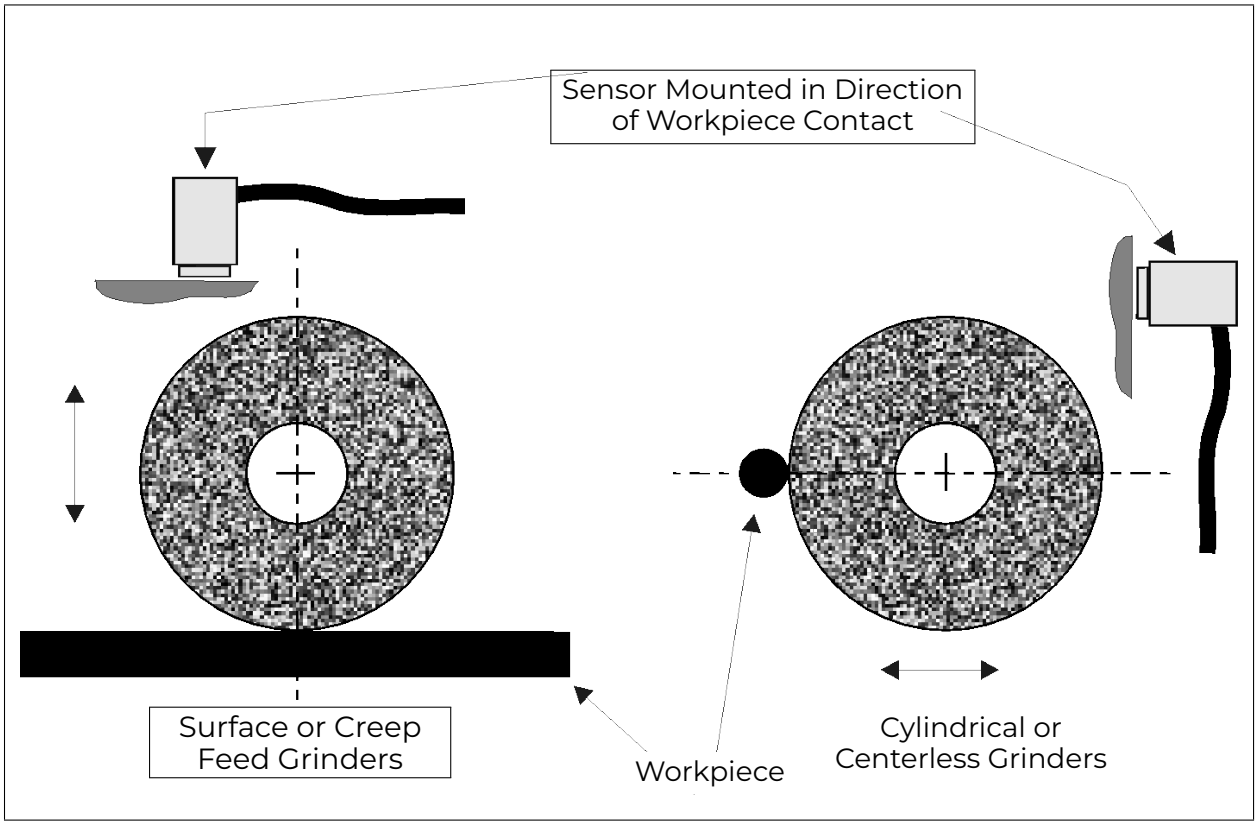
a. SB-6518: 1.5A max at 22 VDC
b. SB-6532: 6A max at 22 VDC

1.7.6 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 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.

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.



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.

2 Basic Software Usage

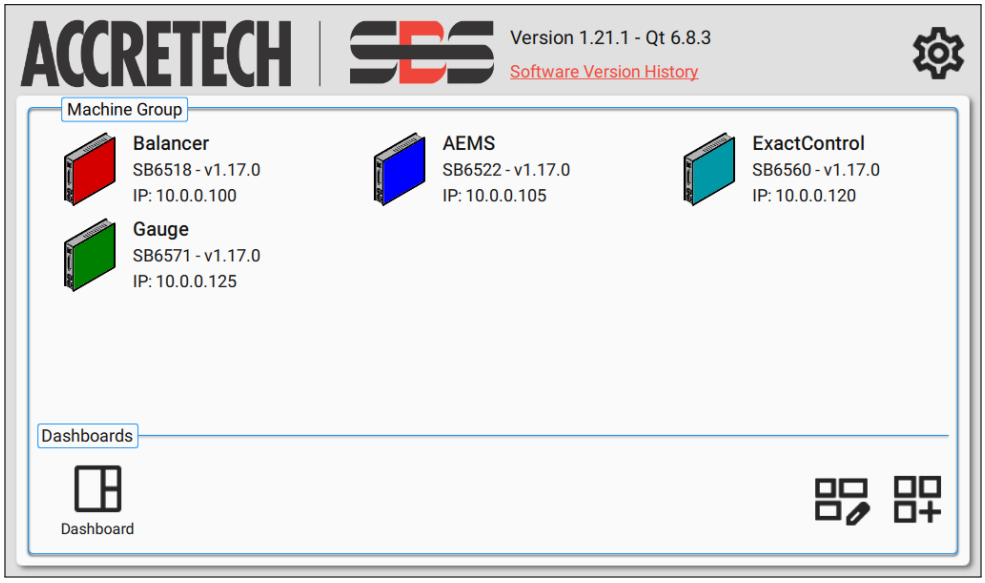
When the software starts up it will load the last connected machine group. If no machine group exists, you will be prompted to create one.

The home page is the primary form of program navigation. Clicking on any module or dashboard graphic will go to its specific visualization. It also provides navigation to the settings page and Module Management interface.



SBS Home Button

Clicking on the SBS Home button from the module main screen returns you to this home screen.



SB6500-Software Home Screen



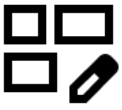
Module Management



Software Settings



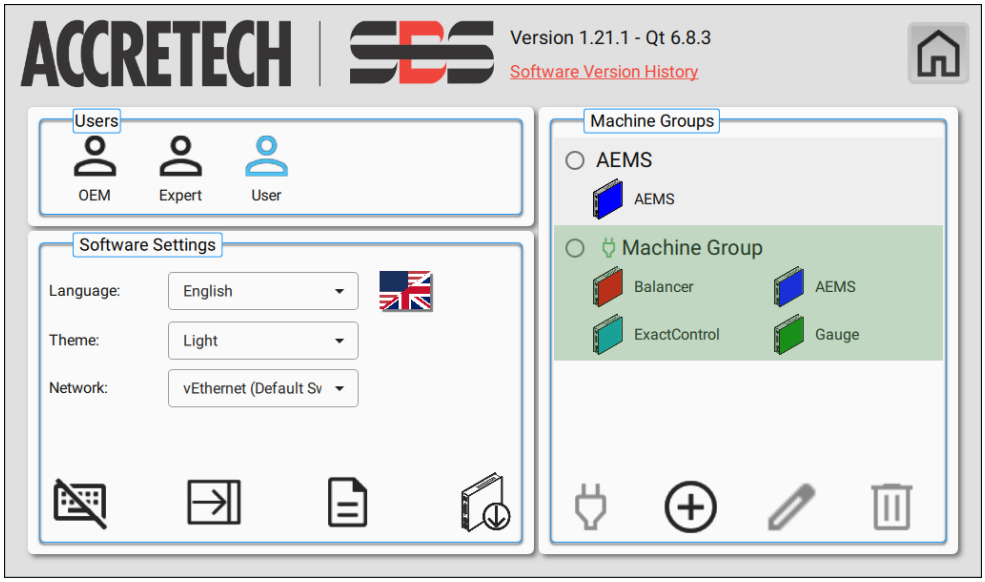
Create New Dashboard



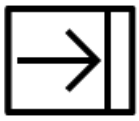
Edit Dashboard

2.1 Software Settings

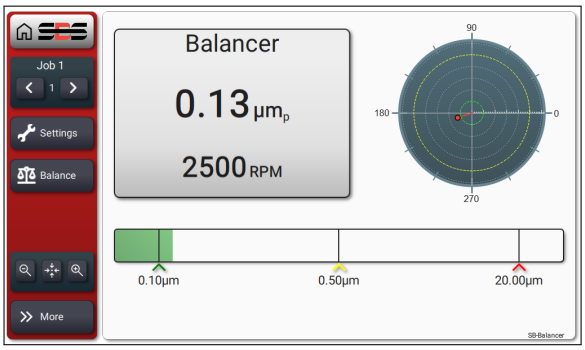
This section allows changes to the overall user experience, including language, color theme, and active network adapter. Custom color themes can be created, using Light or Dark mode as a starting point. Saving a custom theme is currently not supported.



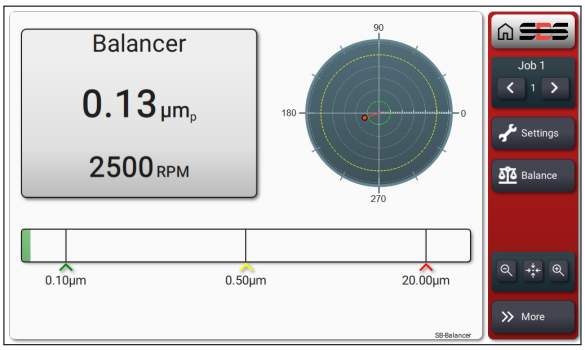
SB6500-Software Settings Page



The placement of the module control bar can be controlled by the operator by toggling the control bar position button.

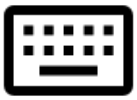


Left Module Control Bar

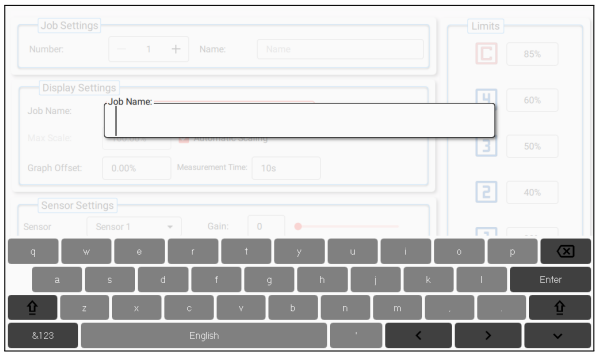


Right Module Control Bar

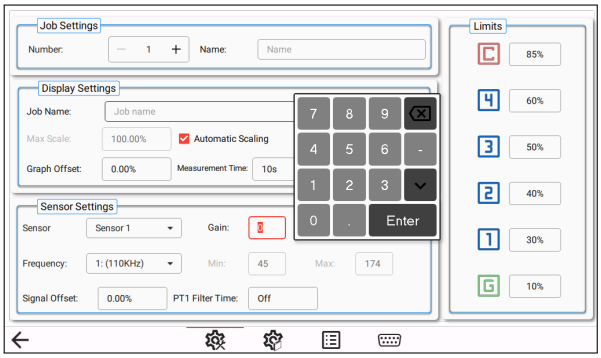
2.1.1 On-Screen Keyboard



The keyboard button enables the onscreen keyboard to appear when contextually necessary. If editing a value that uses alphanumeric characters, the full-sized keyboard will appear. In the case that you are editing a value that only accepts numeric values, a number pad keyboard will appear next to the control.



Full-sized keyboard



Number pad keyboard

2.1.2 Software Event Log

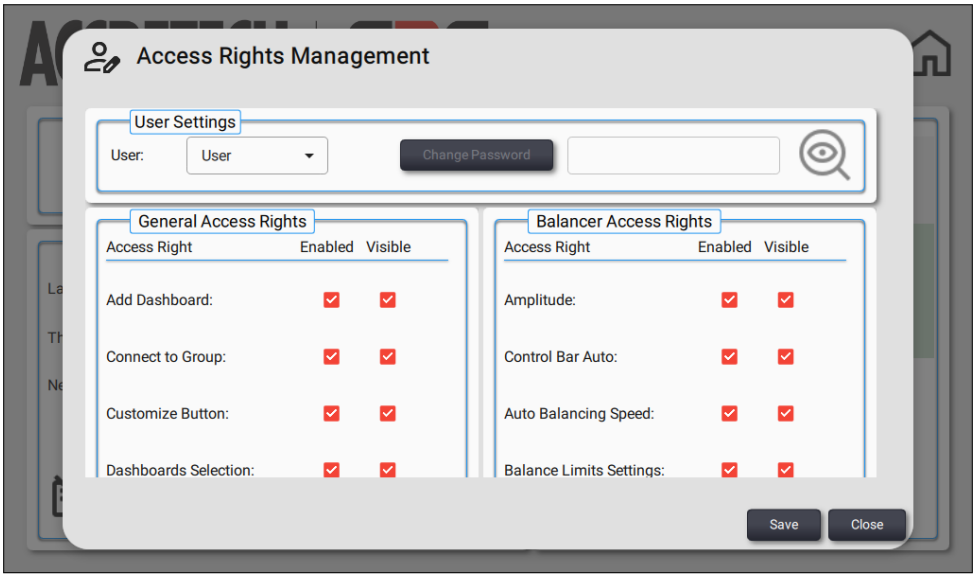


The software event log button shows the events that occur on a global software level. See Event Log for module-specific information.

2.1.3 Network

Select the network adapter to use for connecting to modules. If there are any issues finding modules for machine group creation or connection, it is important to try changing the network adapter to the one that is connected to the network the modules are on.

2.1.4 Access Rights



Access Rights Settings as OEM

Under the user's card are the three available user profiles for the software. Each one is intended to have different access levels to the software but must be configured by the OEM before use. The system remembers the last logged in user and will re-login to that user level on next boot without prompting for a password. The three different levels have these inherent abilities that cannot be changed:

1. OEM
    a. Can edit the access rights of the other two users.
    b. Cannot change access rights for the OEM user. OEMs always have full access to all features.
    c. Can change the password for the OEM, or Expert.
2. Expert
    a. Can have a password assigned by the OEM.
    b. Can have access rights assigned by the OEM.
3. User
    a. Cannot have a password assigned.
    b. Can have access rights assigned by the OEM.

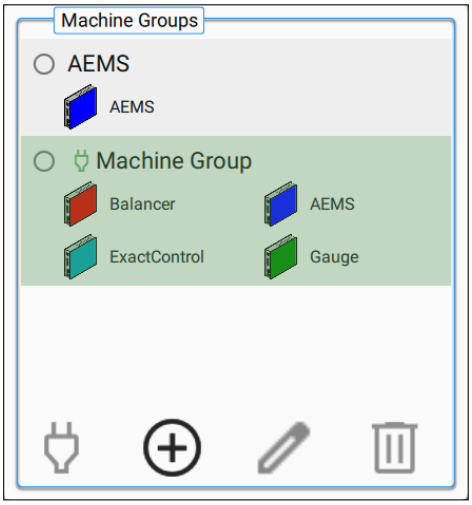
Warning: Losing or forgetting the OEM password can only be fixed by an SBS service provider. If you have been locked out of the system, please contact support for assistance.

2.2 Machine Groups

A Machine Group is a selection of control modules that the operator wishes to display and interact with. To interact with an SBS control module of any type, it must be a member of a Machine Group. Modules may be members of multiple machine groups. The Machine Group currently active is marked with a green plug icon.



Green Plug Icon



Machine Group Manager



Connect to selected Machine Group



Create Machine Group



Edit Machine Group

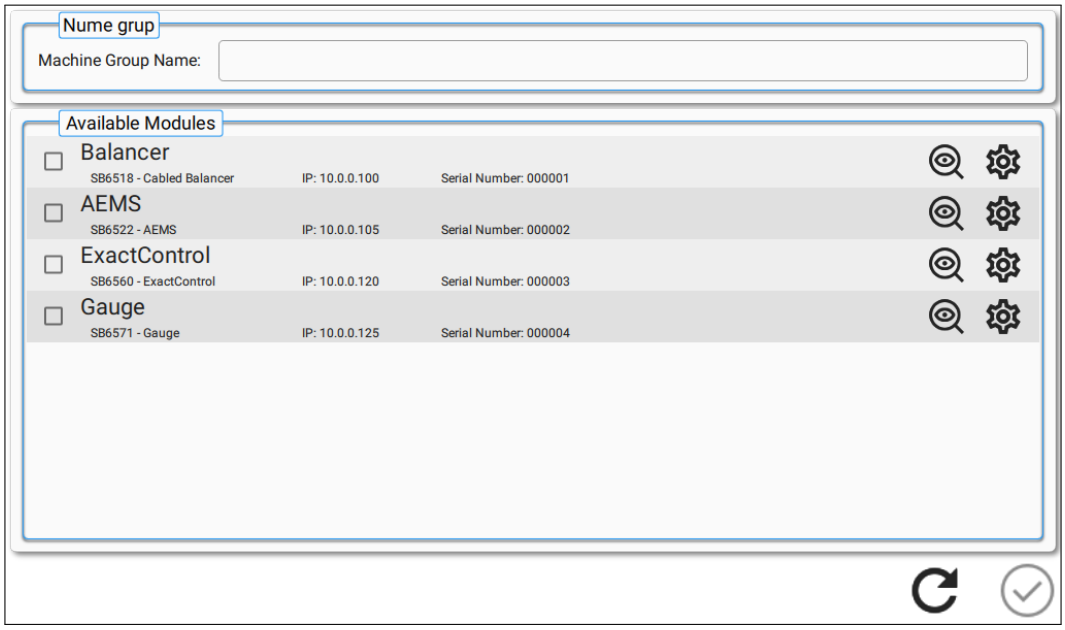


Delete Machine Group

2.2.1 Create Machine Group

Clicking the "Create Machine Group" (+) button initiates a search on the connected network for all SBS control modules. Devices found will be displayed in the Available Modules list. If the module you are looking for does not show on the list, wait 30 seconds, then refresh the list. Mark any modules you wish to add, name the Machine Group, then click "Create".

Some modules may be listed in red text with their IP as "Not on Network". This means that the module is not on the same subnet as the computer's network adapter. The SB-6500 Software cannot connect to the module in this state; however the module's IP can be changed by editing its Network Settings via the "Edit Network Settings" button. By default modules use the "Auto-set IP" setting. This means modules use DHCP for IP assignment, and when DHCP is not available, a link-local address is assigned (169.254.x.x).



Machine Group Creation



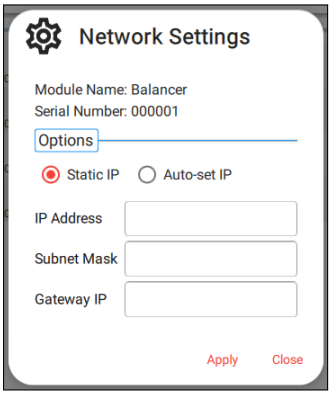
Identify Module: Will flash yellow LED on module three times.



Refresh Module List.



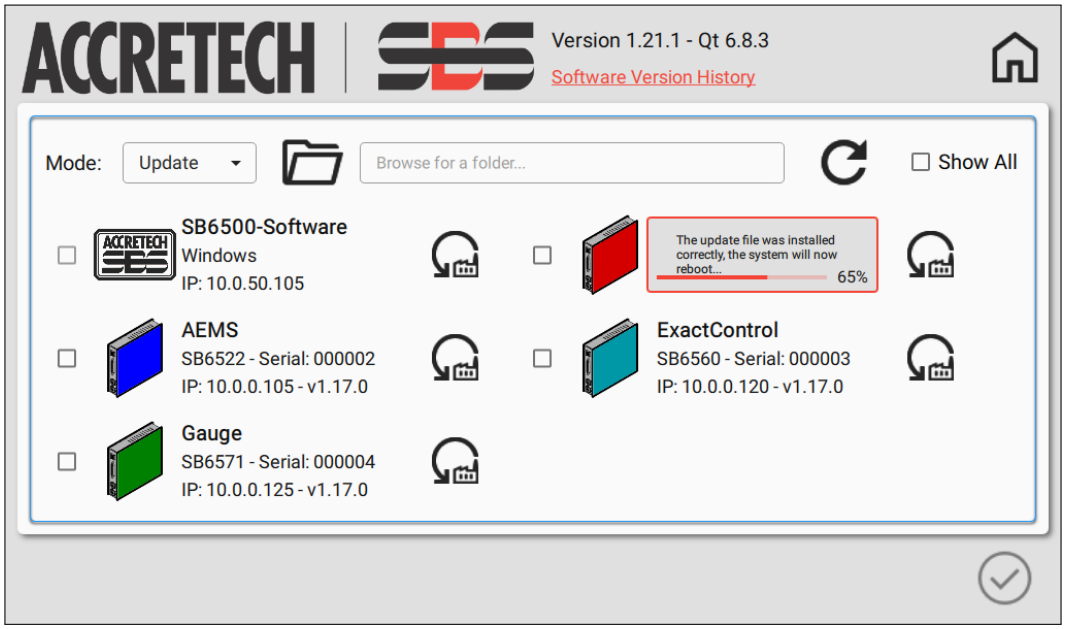
Edit Network Settings.



Network Settings Screen

2.2.2 Software Update

To update the software on the SBS control module, browse to the folder containing the update file. The list of modules displayed will be populated from the active Machine Group. Check the Show All box to show all modules on the network. Select the modules you wish to update, then press the “Start Updating” button.



Module Manager



Go to Module Manager



Select Update Folder



Start Updating

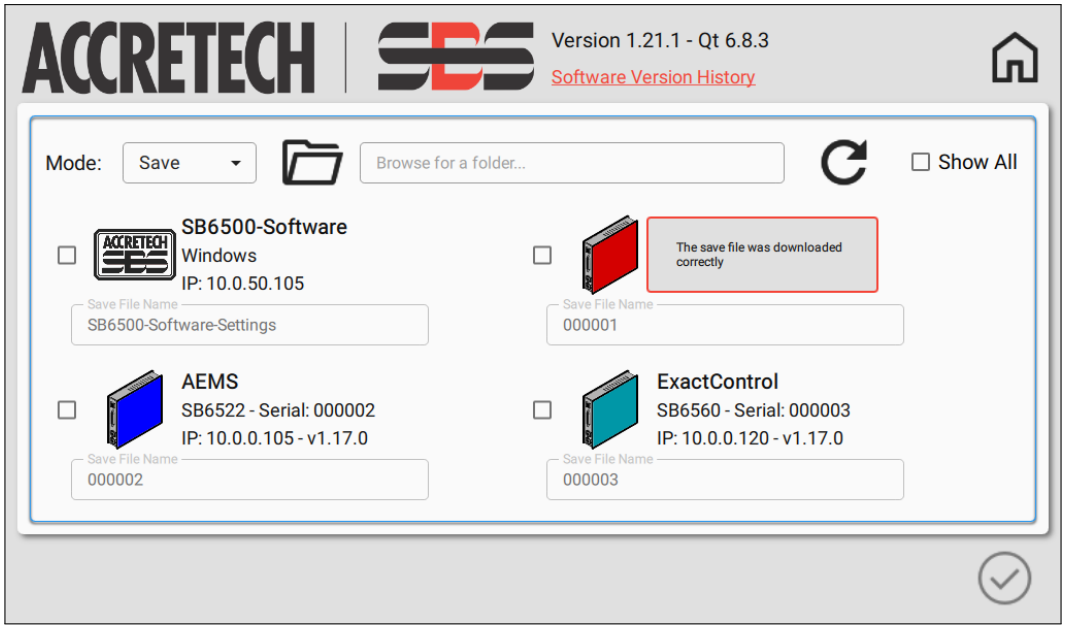


Factory Reset: Resets all module parameters back to default values. Includes network settings.

2.2.3 SB6550 Update

If running on an SB6550 display, the updating screen will include the Display as an option. The display update file should be in the same folder as the module update file.

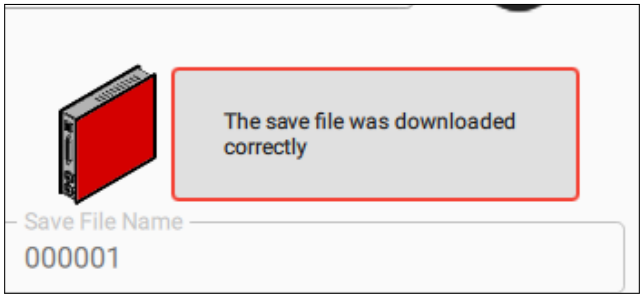
2.2.4 Save / Restore



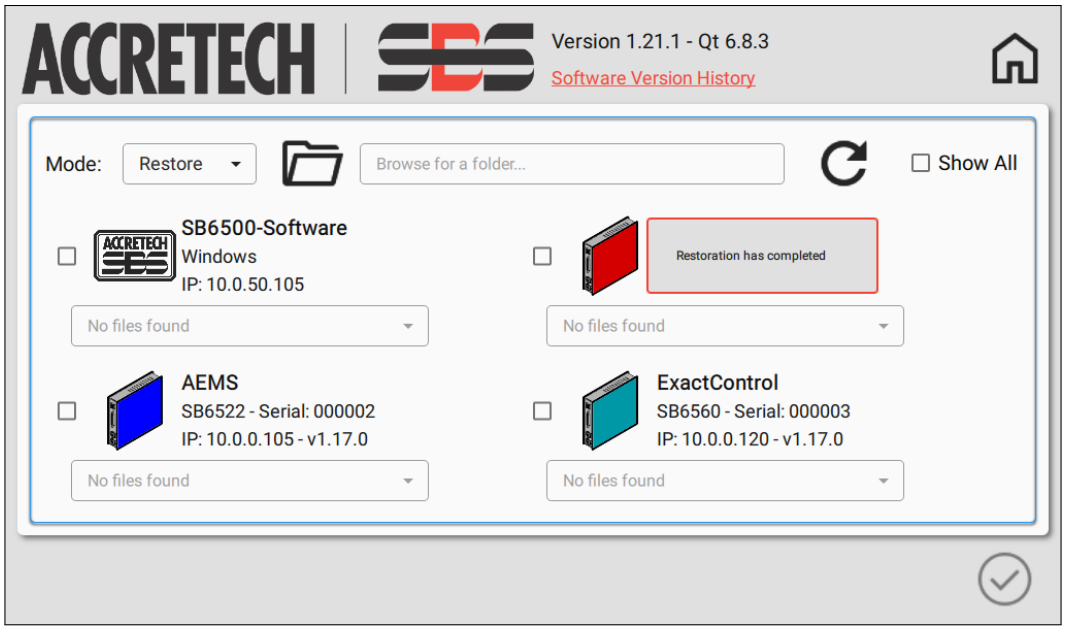
Save Menu

By changing the mode to Save in the module manager, you can save the current settings of any module to a file. That file can then be used to restore those settings to any module of the same type. This Save/Restore function allows you to backup the settings at any time for retrieval later or to copy to a new installation.

On an SB6550 display the save file will automatically be placed on a USB drive inserted into the front USB C port. Do not remove the USB drive until all modules show the saving process as complete.



File saved successfully

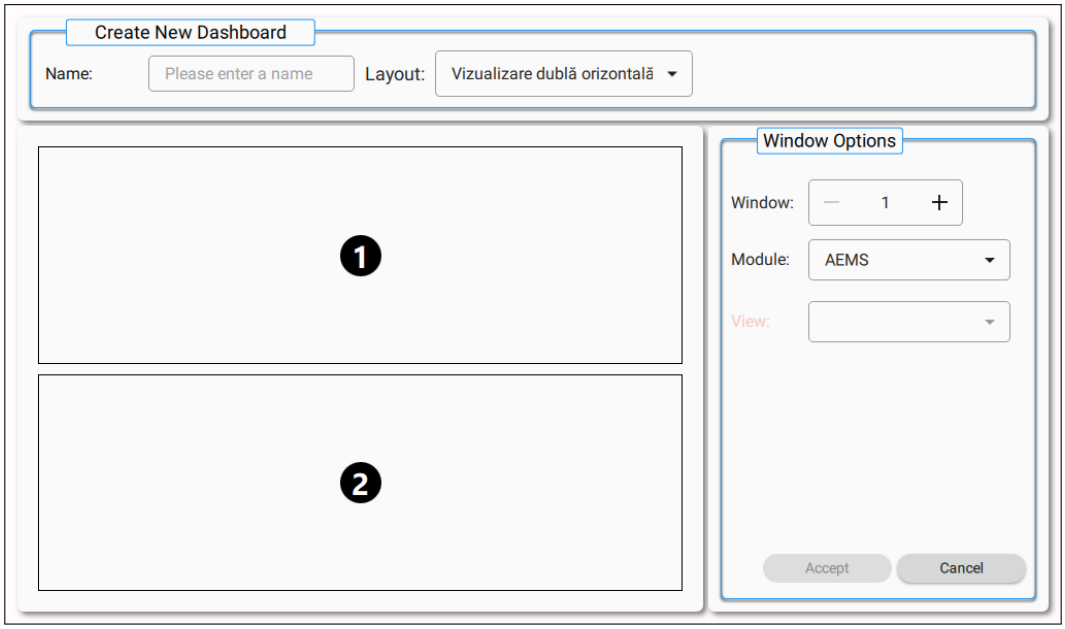


Restore Menu

Changing the mode to Restore brings up the restore interface. Select the modules that should be restored from the file in the target folder. If there is only 1 file for that module type in the target folder it will be selected automatically. Otherwise, you must select which file to use for that module using the drop down. Click the Accept button to begin the restore process. This will completely overwrite the module's current settings with the settings in the restore file. Note that there is no way to undo this process.

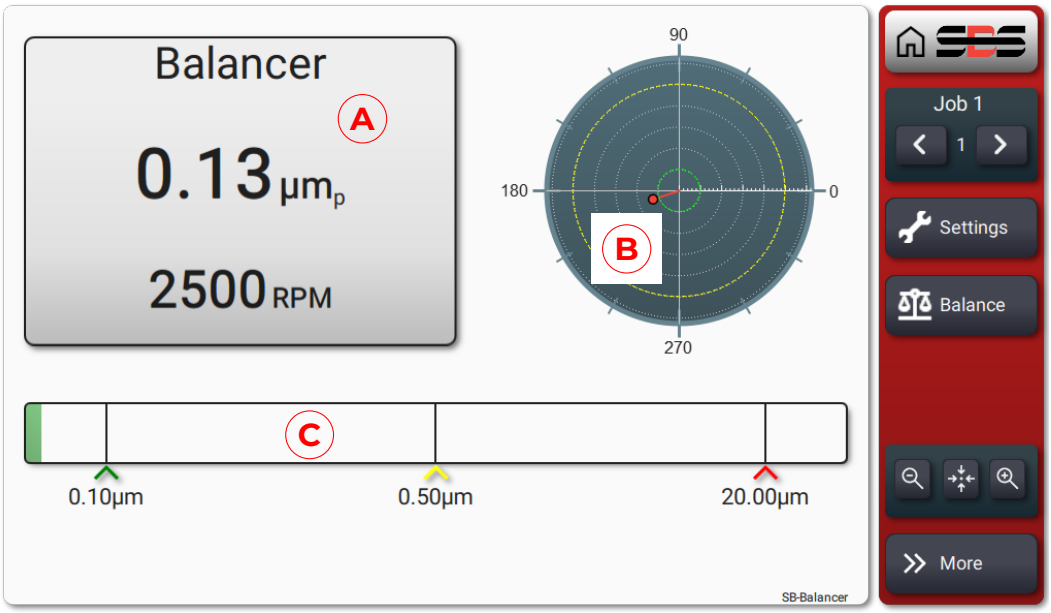
2.3 Dashboards

Operators may create customized user layouts for monitoring several SBS modules on one screen. From the navigation bar, click Create New Dashboard from the Dashboards option. Select the preferred layout from the list. Assign a module to each numbered window in the Windows Options box. Depending on the size and shape of the window and the module type assigned, further options may be available for you to choose from. When complete, press Accept to launch the dashboard. This dashboard will be added to the list at the bottom of the home page for this machine group.



Dashboard Layout

3 SBS Balancer Operation



SBS Balancer Main View

This is the main screen of the SBS Balancer system. There are several elements in the main view.

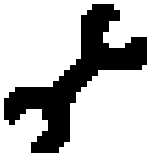
A) Info box. Displays module name, vibration in selected units, and RPM of spindle.

B) Polar Plot. This shows the vibration amplitude and phase of the vibration relative to a reference point internally created in the SBS system. Note: there is no relationship on the displayed angle to any external scale on the grinding machine.

C) BAR GRAPH. The bar graph shows the measured vibration level compared with the LIMIT, TOLERANCE, and CRITICAL levels.

The Control bar for SBS Balancer displays different options, depending on the specific configuration. Enabling Jobs or changing the balancing mode from Auto to Manual will change the options shown.

3.1 Settings



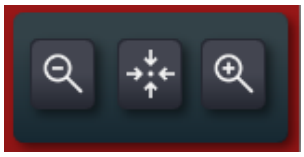
Pressing this button allows you to modify any of the balancing parameters, access the event log, and the I/O diagnostics screen. See the Navigation Bar section for more information.

3.2 Balance

Initiates the balancing process. If SBS Balancer Strategy is set to Auto, an automatic balancing process will start. If Balancer Strategy is set to Manual, the manual balance wizard will present. See Automatic Balancing and Manual Balancing for more information.

3.3 Graph Controls

This interface allows you to increase, decrease, or reset the graph scale. It is available whenever an on-screen plot or graph permits manual adjustment of the scale for better interrogation.



3.4 Automatic Balancing

Once all operating parameters are set, the SBS Control Unit is ready to perform automatic balance cycles, which are initiated by pressing the Balance button or by a Start Balance command via the Hardwire or Software interfaces. It is important to understand that Auto-Balance is an automatic cycle that is initiated by the user, performs according to the set operating parameters, and then ends. **Between balance cycles, the system will report vibration levels and RPM, but will not self-initiate an Auto-Balance cycle**.

Auto-Balance should be performed with the machine running, and coolant flowing. **Auto-Balance should not be performed while the wheel is in contact with the workpiece or dresser**. The process of grinding, dressing, or moving the wheel can all introduce vibrations into the machine which are unrelated to wheel balance. Attempting to balance during such processes will not work and will have detrimental effect on the grinding or dressing results.

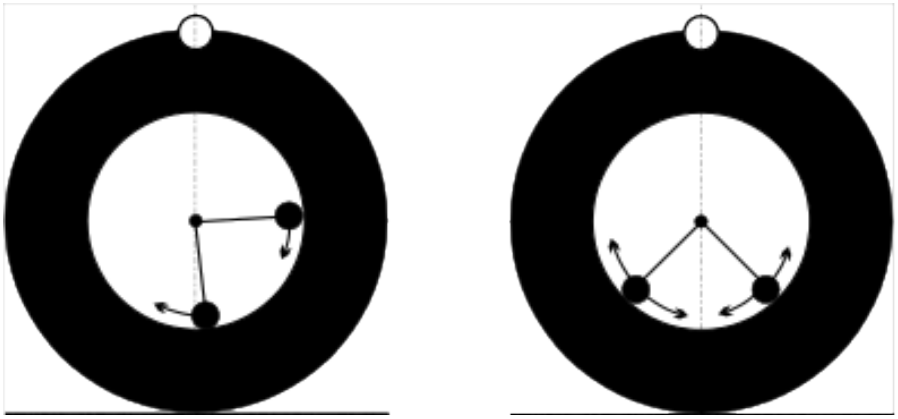
3.5 Manual Operation of Automatic Balancer



The SBS Balance System is fully automatic but can also be operated manually. The ability to move the balance masses in the Balancer manually is useful for performing diagnostic tests and allows operators to manually balance machines where desired.

Manual Balance buttons are accessed by activating the Manual Controls switch. A manual RPM can be specified when no RPM signal is received from the balancer. The buttons are divided into two groups, each controlling one of the two masses in the balancer (M1 and M2). Each mass can be moved in either the forward or backward direction, with reference to the rotation of the grinding wheel. **Only one button may be operated at a time**.

To manually balance, move the two masses in the direction which reduces the vibration reading on the Vibration Display. This should be accomplished in three stages.



Stage 1 *Stage 2*

Stage 1: Move each of the two masses equally in the same direction, either forward or backward. If moving one direction increases the vibration, then choose the opposite direction. Continue this way until the vibration level can no longer be reduced. This movement positions the two masses equally about a line through the center of the wheel and the center of the imbalance, shown by the white dot.

Stage 2: Find the correct angle for position of the masses in relation to the "center line". Do this by moving the masses equally in different directions (one forward and one backward). Again, if the vibration level is increased, the opposite weight movement should be tried. This stage is complete when the vibration level can no longer be reduced.

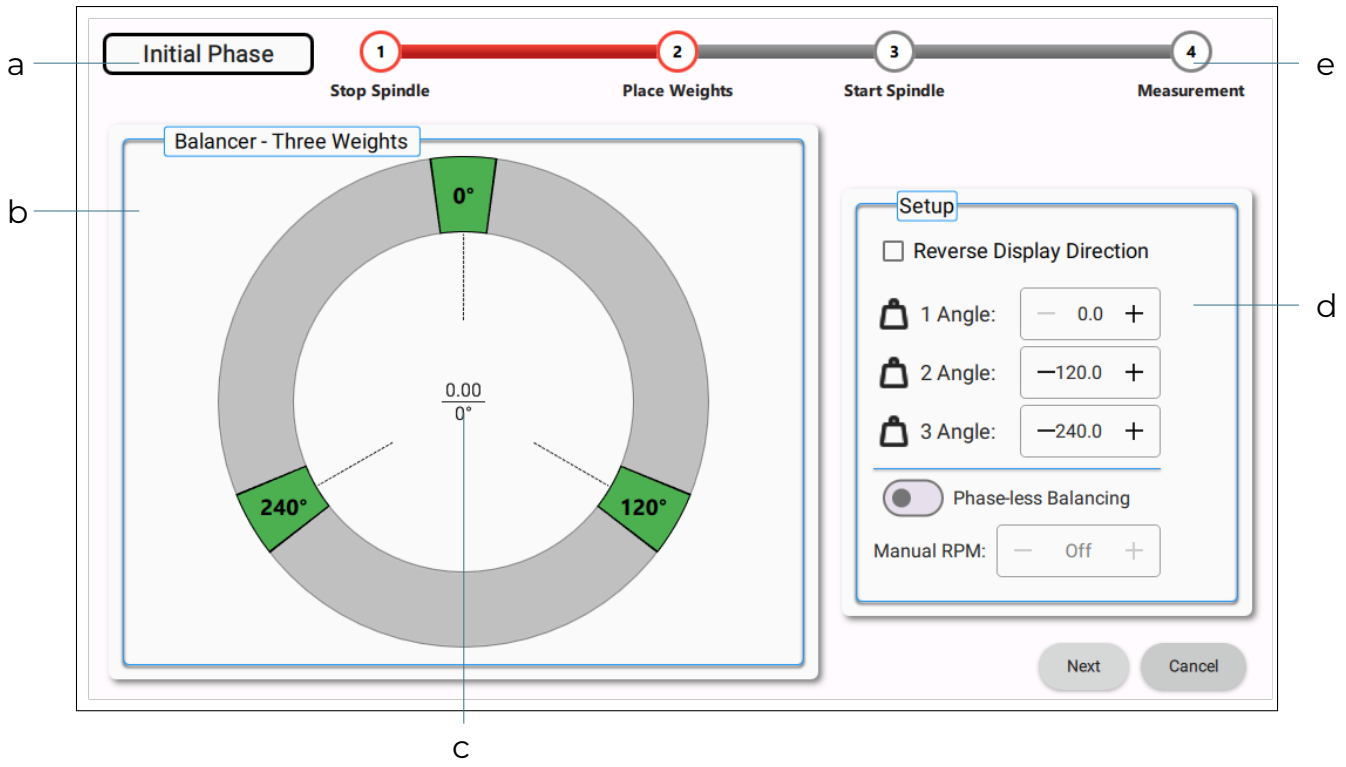
Stage 3: The balance level can be fine-tuned by moving the masses individually in small increments, in order to minimize the vibration reading. Any change in vibration level of the machine will lag behind the movements of the masses by one or two seconds. This is due to a "settling effect" of the machine. When the correct direction of movement is not immediately clear, or the vibration level itself is small (2.0 microns or less), any movement of the masses should be performed in small increments, with a delay of two seconds between movements to evaluate each movement's effect.

3.6 Manual Balancing

When the balancing Strategy is set to Manual, pressing the Balance button will engage the Manual Balancing Wizard. This interface offers a simple step-by-step guide to the manual balance process. There is a minimum of three phases for each balancing cycle:

Initial Phase	The vibration level is measured and saved.
Test Phase	A test weight placed on the machine so its effect can be measured.
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.



The major elements in the main view are:

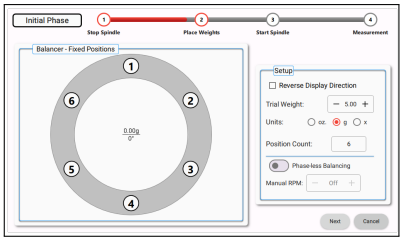
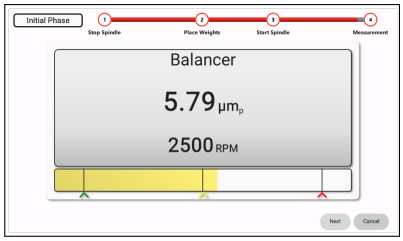
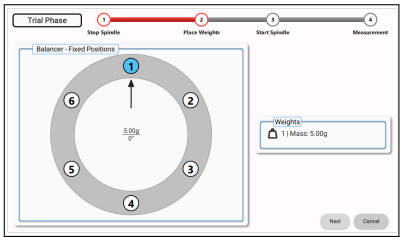
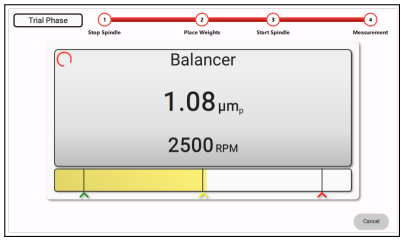
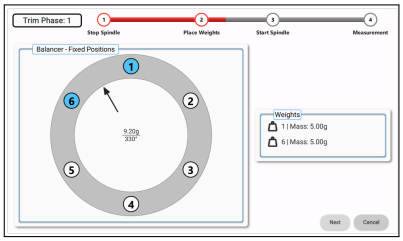
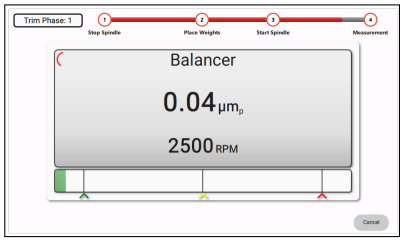
a) Indicator of which phase you are at in the process.

b) Place Weights. Shows a graphic view of the type of balancing solution requested in the settings and where to place the weights needed before measuring the vibration.

c) Vector Equivalent. This number is the single mass/angle solution if all weights and angles were added together in the given balancing method.

d) Parameter editing. Depending on the balancing method, different options present to allow for changes to the current values before making a vibration reading.

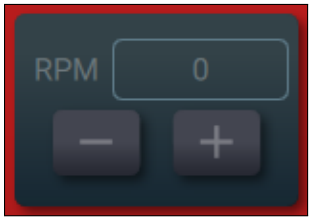
e) Phase status bar. Each phase has four steps: stop spindle, place weights, start spindle, measure vibration.

	Stop Spindle	Place Weights	Start Spindle	Measure Vibration
Initial Phase				
Test Phase				
Solution Phase				

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.

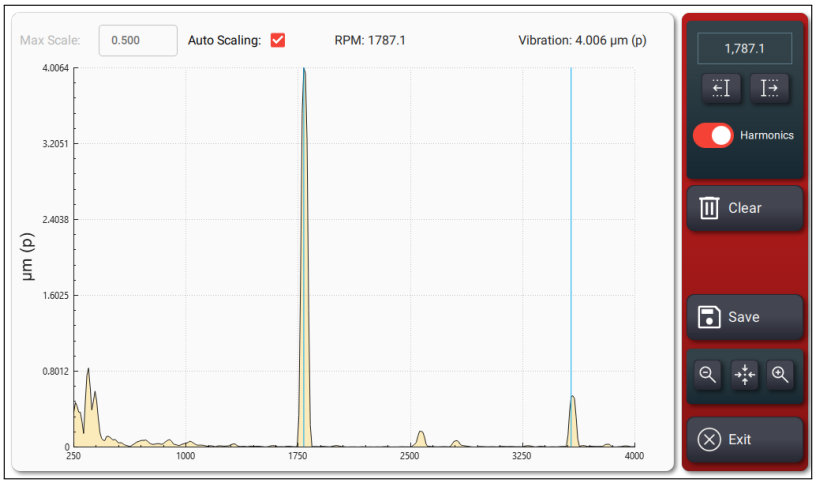
3.7 Manual RPM filter

The system can also be used as a vibration measurement and analysis tool. The Control Unit's vibration frequency filter can be manually adjusted from 25 to 200,000 RPM in increments of one RPM. This allows the Control Unit to operate independently of the Balancer, and to measure vibration levels occurring at different frequencies.



To set the Manual Filter, detach the Balancer Cable from the Control Unit to eliminate any incoming RPM signal. Enter the desired RPM for the manual filter. If desired, the Manual Filter level can be adjusted to display vibration levels at other frequencies. A complete analysis of all frequencies of interest is also available using the FFT Vibration Plot feature.

3.8 FFT Vibration Plot

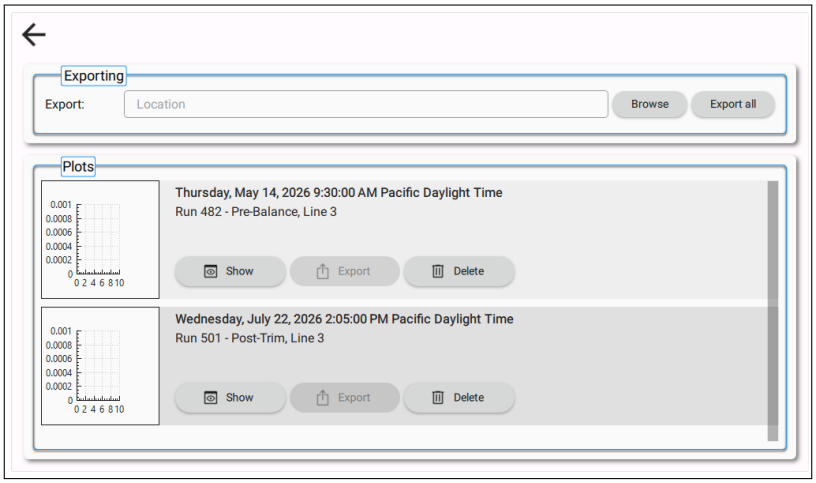


FFT Graph with Harmonic Cursor Active

This activates the FFT interface of SBS Balancer. The graph shows the signal output of the currently active sensor from 30 to 200,000 RPM.

A graph control interface is available, as well as an option to define the maximum graph scale. Activating the Auto Scaling function will rescale the FFT to ensure all data is shown on screen.

Press Start to activate graphing. Stopping activates the on-screen cursor. Use the buttons, mouse or touch interface to move the cursor on the screen. The frequency/RPM and signal amplitude are displayed at the top. Activating the harmonic cursor option displays the cursor as well as multiples of the selected frequency on the graph.



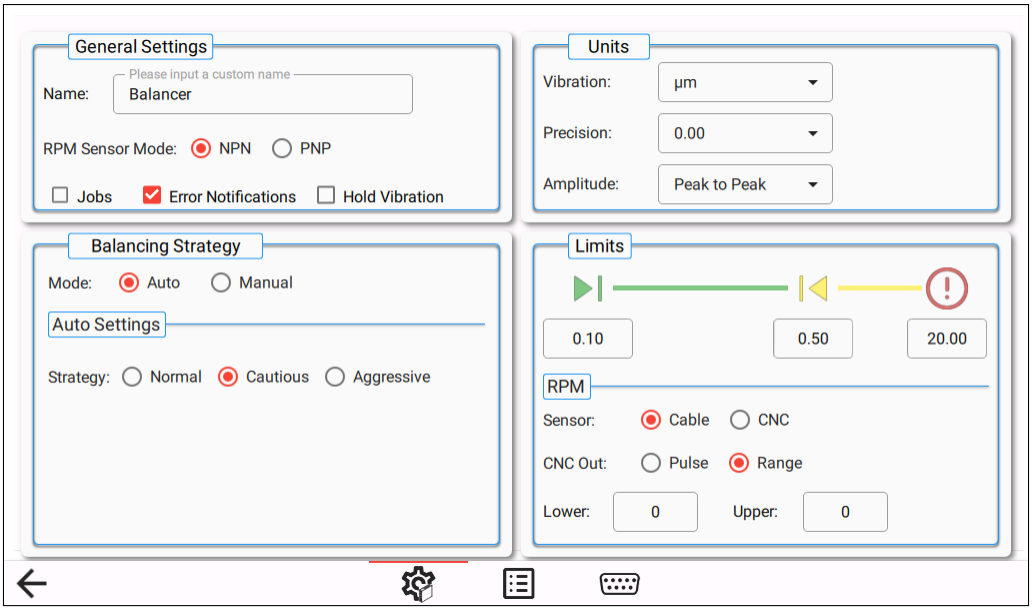
FFT Vibration Plot History Interface

Saving a Vibration Plot will store the FFT data in the Control Module memory, along with the date and time of the recording, the frequency and units of measure, and any comments entered about the measurement.

Saved measurements can be reloaded for view or exported in .csv file format.

3.9 Module Settings

The Module Settings contains the user selectable operation settings for the SBS Balancer System. It is broken into four sections: General Settings, Units, Balancing Strategy, and Limits.



Balancer Module Settings

4 Navigation Bar

The Navigation Bar, found at the top of the settings menu, contains the user-selectable operation settings for the SBS Balancer system as well as troubleshooting and setup tools for the hardwire interface. Press ← at the top left of the menu bar to return to Main Operation.

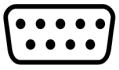




Module Settings



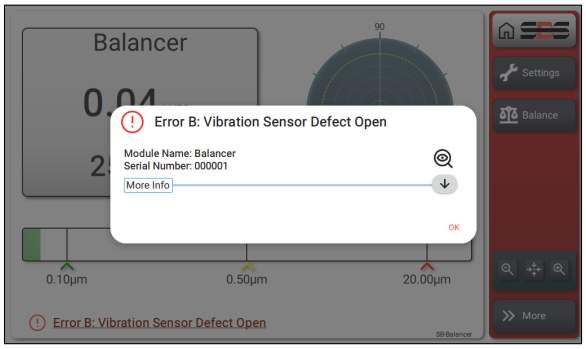
Event Log



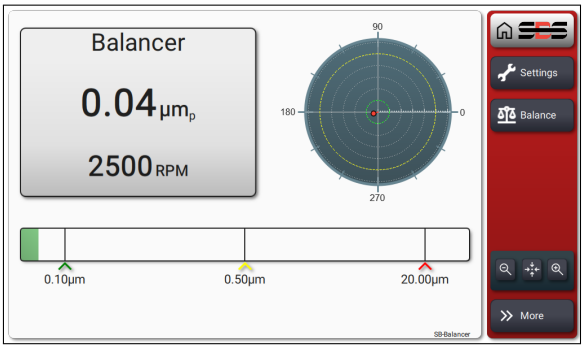
I/O Diagnostics

4.0.1 General Settings

The display name of the control unit can be assigned here. The SBS Balancer also has options for enabling the job feature and the hold vibration, as well as deciding to enable or disable notifications to better control the user experience. The Hold Vibration feature freezes the vibration value after an auto balance in place and no longer shows changes to the value until the next auto balance. Note that this feature is for visual purposes only.



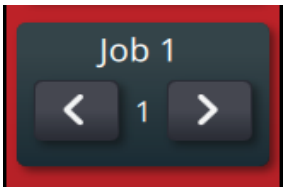
Example with Notifications Enabled



Example with Notifications Disabled

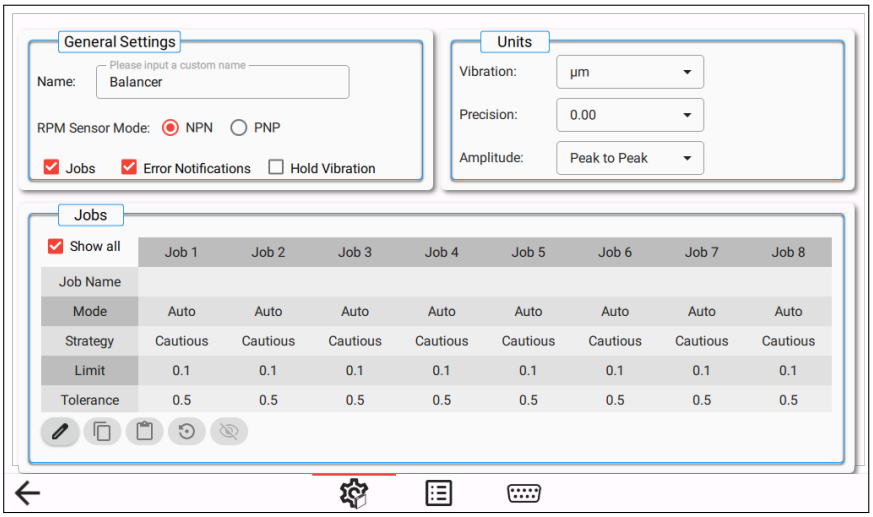
4.0.2 Jobs

The SBS Balancer can remember the Balancing Strategy and Limits parameters of up to eight different configurations. To enable this function, activate Jobs in general settings.



A Job Selection interface will be added to the control bar that shows the current job name and number. Jobs that have been marked “hidden” will be skipped when using the arrows to select from the available jobs.

When Jobs are enabled, a Jobs Table will present when on the Module Settings page to provide an overview of all Job settings.



Jobs Table



Edit parameters of the job.



Copy Job Parameters



Paste Job Parameters



Reset Job parameters to default values.



Hide Job.

4.0.3 Copy/Paste Job

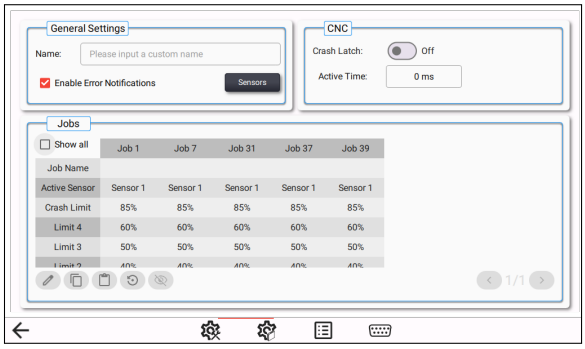
Select the source Job, then press Copy. Select the destination Job and press Paste. This enables quick population of common parameters used in the operation of the Balancer.

4.0.4 Reset Parameters

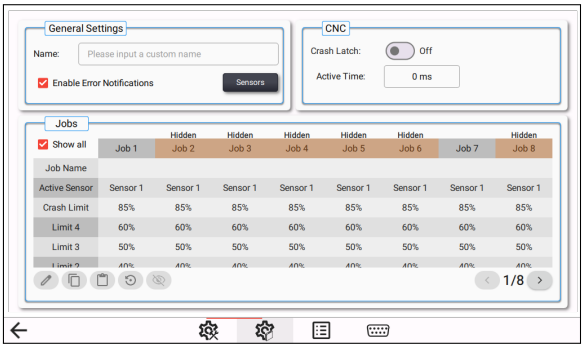
This will change all Job parameters for the selected Job back to the factory settings.

4.0.5 Hiding Jobs

Hiding unnecessary Job numbers can make it easier to find the Jobs needed for operation. Activating the Show All checkbox allows the hidden Jobs to be seen.



Jobs Hidden



Show All active

4.0.6 Vibration Units

Sets the way vibration will be displayed on the SBS Balancer. Select from metric or imperial units of displacement or velocity, define the desired precision and whether the vibration measurement should display in a P-P, 0-P or RMS calculation.

Caution - Changes in the vibration units will not change the Balance Limit values. The user must review and edit the limit settings to an appropriate number, reflecting the Vibration Units settings.

4.0.7 Balancing Strategy

Mode dictates the method the SBS Balance System will use to balance the grinding machine when the balance process is initiated, either by pressing the Balance button or by a Start Balance command via the Hardwire or Software interfaces.

Automatic – Will perform automatic balance cycles using a spindle mounted SBS internal or external balancer. It is important to understand that Auto-Balance is an automatic cycle that is initiated by the user, performs according to the set operating parameters, and then ends. **Between balance cycles, the system will report vibration levels and RPM but will not self-initiate an Auto-Balance cycle**. Auto-Balance should be performed with the machine running, and coolant flowing. **Auto-Balance should not be performed while the wheel is in contact with the workpiece or dresser**. The process of grinding, dressing, or moving the wheel can all introduce vibrations into the machine which are unrelated to wheel balance. Attempting to balance during such processes will not work and will have detrimental effect on the grinding or dressing results.

CAUTIOUS – This setting controls the balance weights in a slower progressive balance mode. It is most useful on high-speed grinders, or other machines where slight movement of the balance weights produces dramatic change in vibration level.

AGGRESSIVE – This setting operates the balancer in the fastest balancing mode. It is most useful on machines with slow speeds and large wheels or machines with installed internal balancers.

NORMAL – This setting uses a combination of a fast-balancing routine until the vibration level reaches 1.0 micron, then switching automatically to a slower routine for accurate balancing.

Manual – Used to balance the grinder by manually positioning balance weights on the grinding wheel. In some applications (especially for large wheels), the Balancer may not have enough correction capacity to balance a new wheel with extreme imbalance. In such cases, the SBS Balance system can aid in positioning manual balancing weights to compensate for the majority of the wheel's imbalance. Automatic balancing can then be used to provide balance control until the next wheel change.

Mass/Angle (Single Weight) – One weight of variable mass is positioned at an angle.

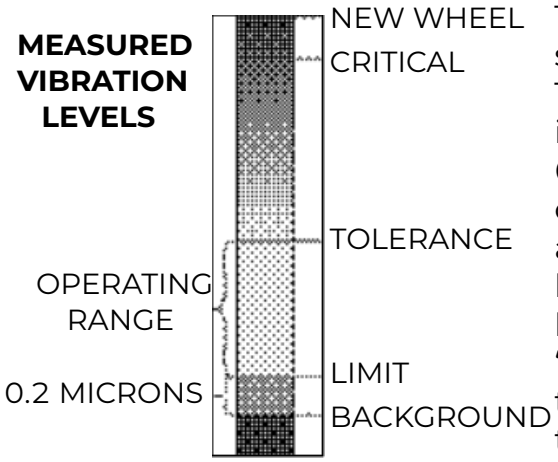
Two Weights – Two equal, fixed mass weights are positioned at variable angle positions.

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.

See Manual Balancing Process for further details.

4.0.8 Balance LIMIT



The SBS Balance System will balance to a user specified low limit of vibration, the Balance LIMIT. The Limit represents the best balance achievable in an auto-balance cycle. It is factory set at 0.4 microns p-p 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 "Environmental Considerations" section. The lower the Limit is set, the longer the system will require to achieve balance. Some experience may be necessary to determine the appropriate 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**.

4.0.9 Balance TOLERANCE

This operator defined setting establishes an upper limit for normal process vibration for the system. When reached, this setting will cause an indication of the need to perform an auto-balance. Indications given on the user interface 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 above the LIMIT setting. Typically, it is set at least 1 micron above LIMIT setting.

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

4.0.10 Balance CRITICAL

This operator defined 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 user interface is shown in the above table, and additional indication is given via both the Hardwire and Software Interfaces. The Critical level must be set above the TOLERANCE setting.

4.0.11 RPM Source

A key component of the SBS Balance System is an RPM sensor, used for controlling the automatic vibration filter and as a reference signal for determining the phase angle of the vibration measurement. Automatic balancers have an integrated sensor that provide this signal from the balancer cable. In certain applications, it may be advantageous to use an external RPM sensor instead of this. For example, when machine clearances do not allow for a non-contact stator to travel with the spindle as it operates, the stator may be mounted in a location that the spindle moves to during the balance process.

The SBS Balance System allows for the RPM signal to be used from either the Balancer Cable or the CNC inputs.

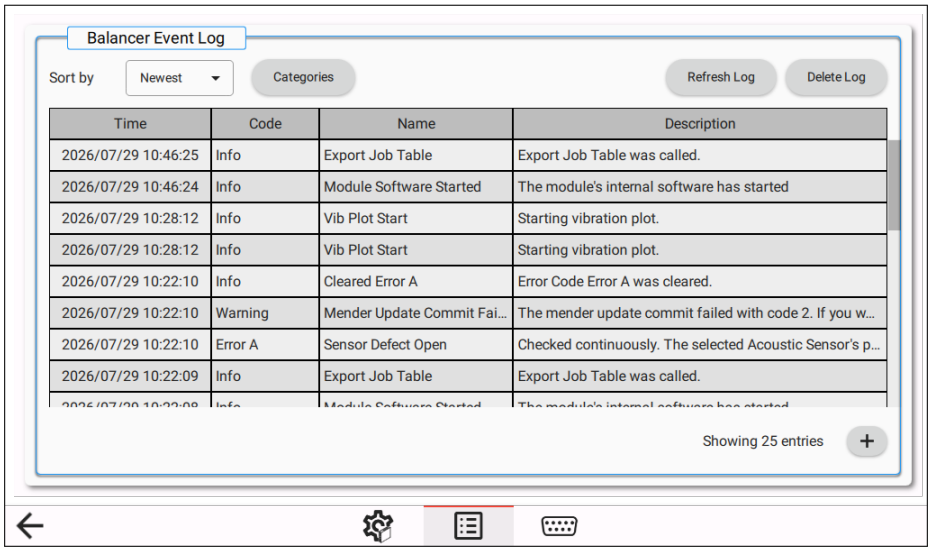
4.0.12 RPM MIN/MAX

These two values 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 the condition as described below.

1) RPM IN RANGE output (Pin 43) will deactivate.
2) Main Operating Screen will indicate out of limit RPM icons, or .

4.1 Event Log

Shows historical data stored on the module. Last 100 entries provided. Additional entries can be viewed by pressing the + button in the lower right corner of the screen. Entries are sortable and can be filtered by their code type. Codes include Info, Warning, Error, and Debug. Clicking on any line will show more information. Clicking on the Refresh log button will refresh this page with the most up to date logs.

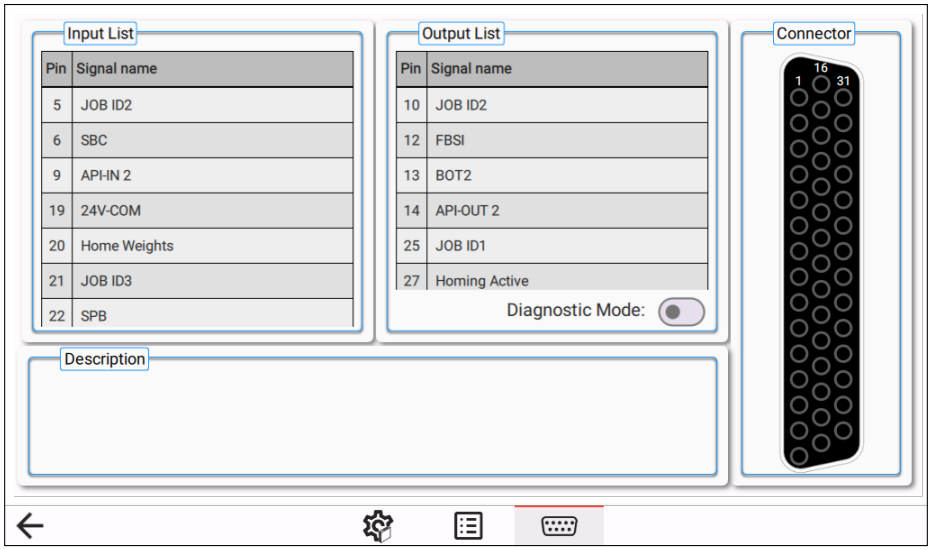


Balancer Event Log

4.2 I/O Diagnostics

Shows a list of all inputs and outputs on the Balancer Hardwire I/O interface. A filled green circle indicates the input is being activated, or the output is in an activated state. Entering Diagnostic Mode through the switch at the bottom of the Outputs group allows the operator to manually force a given output pin into an active state for testing connection function with the grinding machine.

Selecting any input/output provides more information in the Description box and highlights that pin on the Connector image for visual identification.



Balancer I/O Diagnostics

5 Hardwire Interface

Interfacing the SBS 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-44 connector. It is left to the operator to supply the necessary interface hardware. **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.

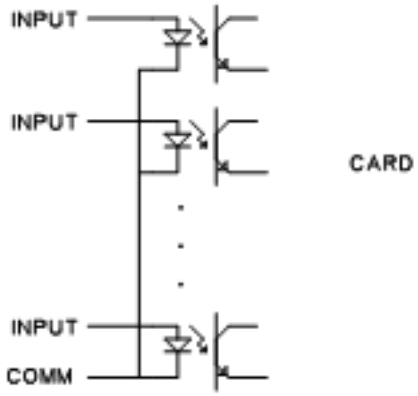
5.1 Digital Supply



An external 24 Volt supply must be connected between I/O common negative (Pin 19) and positive terminals (Pin 30) for the Digital outputs to operate.

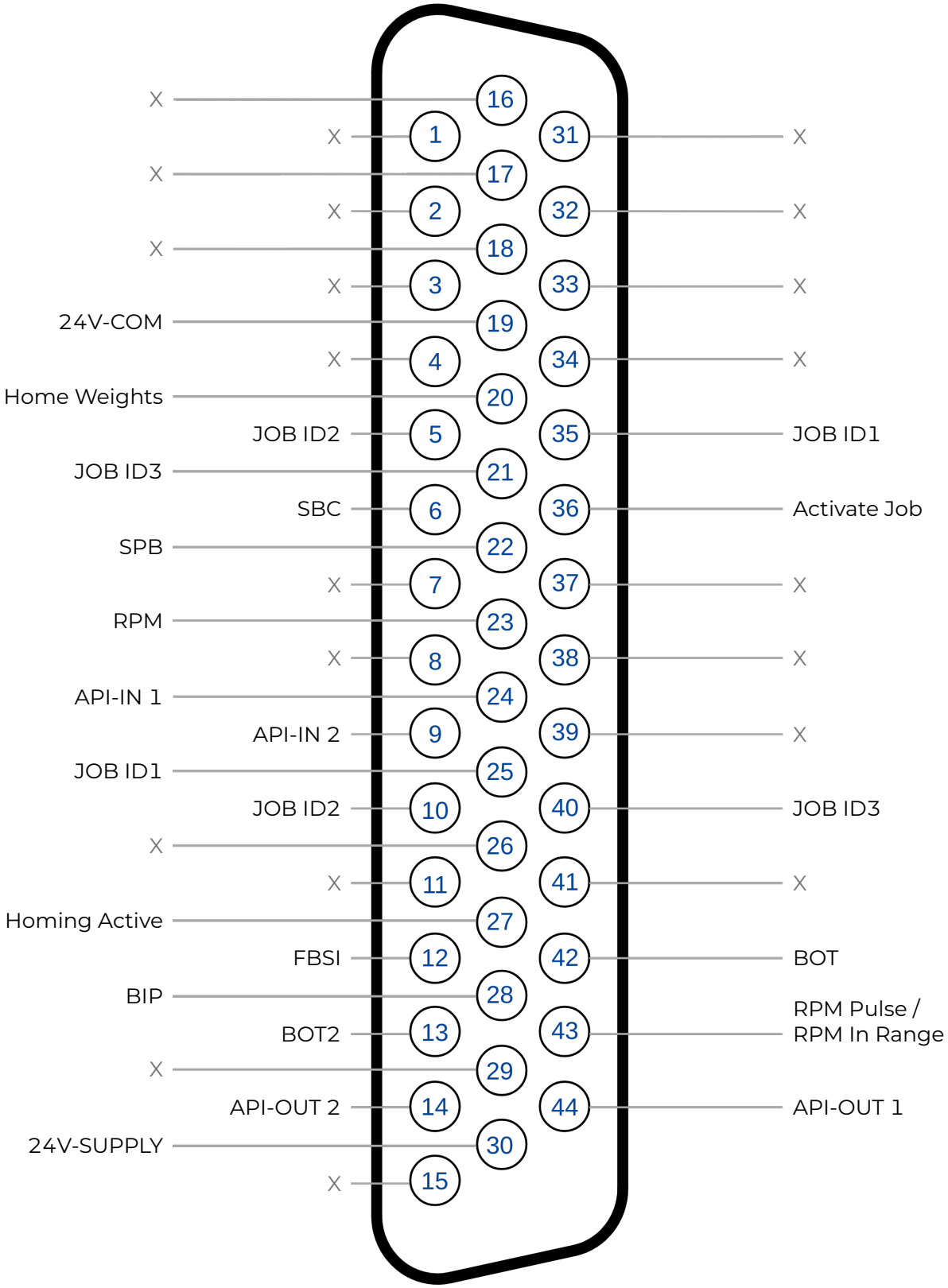
30	24V-SUPPLY	20–28 VDC supply for operation of CNC I/O
19	24V-COM	Reference ground for pin 30.

The Digital IO inputs consist of sixteen transistors with 500 V optical isolation from the system. Each is activated during the application of +24 VDC on its pin relative to the external common pin. Activating the inputs requires 5 mA at a voltage between +18 VDC and 28 VDC. The switching time is less than 1ms. TTL or other logic level conversion of input signals will require an external circuit powered by an external logic power supply.

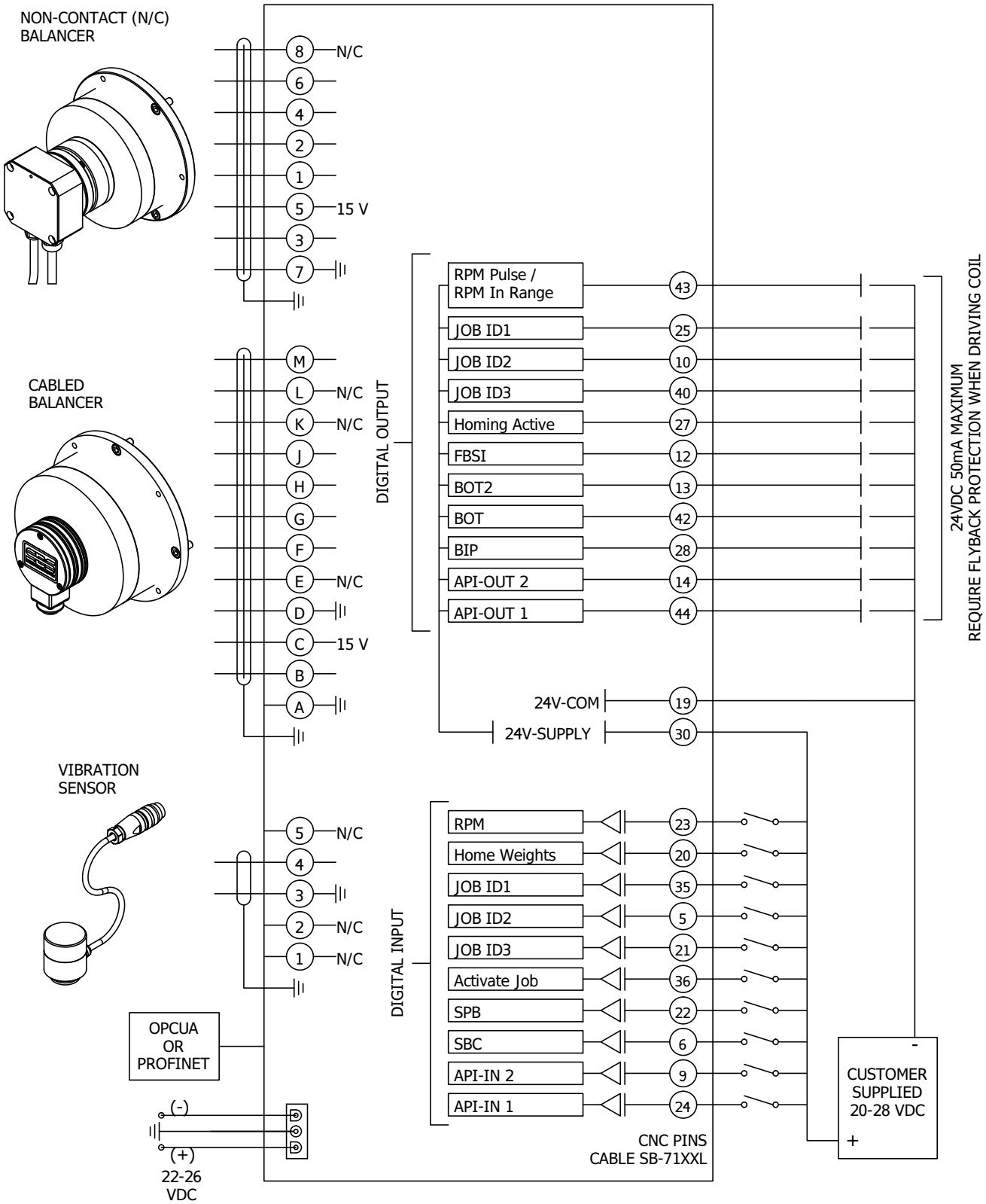


Unidentified pins are reserved for future use.

5.2 CNC DB-44 Pinout



X = Reserved for future use


NON-CONTACT (N/C)
BALANCER
8
N/C
6
4
2
1
5
15 V
3
7
CABLED
BALANCER
M
L
N/C
K
N/C
J
H
G
F
E
N/C
D
C
15 V
B
A
VIBRATION
SENSOR
5
N/C
4
3
2
N/C
1
N/C
DIGITAL OUTPUT
RPM Pulse /
RPM In Range
43
JOB ID1
25
JOB ID2
10
JOB ID3
40
Homing Active
27
FBSI
12
BOT2
13
BOT
42
BIP
28
API-OUT 2
14
API-OUT 1
44
24VDC 50mA MAXIMUM
REQUIRE FLYBACK PROTECTION WHEN DRIVING COIL
24V-COM
19
24V-SUPPLY
30
DIGITAL INPUT
RPM
23
Home Weights
20
JOB ID1
35
JOB ID2
5
JOB ID3
21
Activate Job
36
SPB
22
SBC
6
API-IN 2
9
API-IN 1
24
CNC PINS
CABLE SB-71XXL
OPCUA
OR
PROFINET
(-)
(+)
22-26
VDC
-
CUSTOMER
SUPPLIED
20-28 VDC
+

5.3 Input Pin Names and Functions

<table>
<tr><th>Pin#</th><th>Name</th><th>ACTIVE</th><th>Description</th></tr>
<tr><td>24</td><td>API-IN 1</td><td>HIGH</td><td>Reserved for future use.</td></tr>
<tr><td>9</td><td>API-IN 2</td><td>HIGH</td><td>Reserved for future use.</td></tr>
<tr><td>6</td><td>SBC</td><td>HIGH</td><td>Start Balance Command: momentarily activated to initiate an automatic balance operation. The rising edge of this signal starts the operation. There is no response if Balancing Strategy is in Manual mode.</td></tr>
<tr><td>22</td><td>SPB</td><td>HIGH</td><td>Stop Balance Command: while active, stops an automatic balance operation in progress and inhibits a new automatic balance command from the hardware or software interface. The on-screen Balance button remains functional.</td></tr>
<tr><td>36</td><td>Activate Job</td><td>HIGH</td><td>Sets the active job to match the sum of the Job ID inputs on the rising edge. Deactivating the input does not stop the job.
<table>
<tr><th>JOB ID3</th><th>JOB ID2</th><th>JOB ID1</th><th>Job Value</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>3</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>5</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>6</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>7</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>8</td></tr>
</table></td></tr>
<tr><td>21</td><td>JOB ID3</td><td>HIGH</td><td>Most-significant Job Select input bit.</td></tr>
<tr><td>5</td><td>JOB ID2</td><td>HIGH</td><td>Middle Job Select input bit.</td></tr>
<tr><td>35</td><td>JOB ID1</td><td>HIGH</td><td>Least-significant Job Select input bit.</td></tr>
<tr><td>20</td><td>Home Weights</td><td>HIGH</td><td>SB-6532 module only. Drives balancer weights to the null position (180 degrees apart) if the balancer supports this option. Activates on the rising edge; output pin 27 indicates an active homing request. The spindle must be stopped before homing the weights.</td></tr>
<tr><td>23</td><td>RPM</td><td>HIGH</td><td>RPM signal input for use as an alternate source to the RPM signal supplied through the balancer cable.</td></tr>
</table>

5.4 Output Pin Names and Functions

<table>
<tr><th>Pin#</th><th>Name</th><th>ACTIVE</th><th>Description</th></tr>
<tr><td>44</td><td>API-OUT 1</td><td>HIGH</td><td>Reserved for future use.</td></tr>
<tr><td>14</td><td>API-OUT 2</td><td>HIGH</td><td>Reserved for future use.</td></tr>
<tr><td>28</td><td>BIP</td><td>HIGH</td><td>Balance In Progress: active while an automatic balance operation is in progress.</td></tr>
<tr><td>42</td><td>BOT</td><td>LOW</td><td>Balance Out of Tolerance: active when measured vibration exceeds the operator-set TOLERANCE value; remains active when vibration exceeds CRITICAL.</td></tr>
<tr><td>13</td><td>BOT2</td><td>LOW</td><td>Balance Out of Tolerance Two: active when measured vibration exceeds the operator-set CRITICAL value.</td></tr>
<tr><td>12</td><td>FBSI</td><td>LOW</td><td>Failed Balance / System Inoperative: inactive (pin reads high) during normal powered operation after a successful power-on self-test. De-energizes in standby, power-off, error, or fault conditions.</td></tr>
<tr><td>27</td><td>Homing Active</td><td>HIGH</td><td>SB-6532 module only. Active while the Home Weights process is running.</td></tr>
<tr><td>43</td><td>RPM Pulse / RPM In Range</td><td>HIGH</td><td>RPM Pulse: activates once per revolution as a buffered balancer RPM signal. Supported through 30,000 RPM; above this speed the output remains active.
RPM In Range: activates when spindle RPM is between the MIN and MAX settings. With only one limit enabled, it activates on the permitted side of that limit. It remains inactive when both limits are disabled.</td></tr>
<tr><td>40</td><td>JOB ID3</td><td>HIGH</td><td>The three JOB ID outputs identify the active Job using the table below.
<table>
<tr><th>JOB ID3</th><th>JOB ID2</th><th>JOB ID1</th><th>Active Job</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>3</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>4</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>5</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>6</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>7</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>8</td></tr>
</table></td></tr>
<tr><td>10</td><td>JOB ID2</td><td>HIGH</td><td>Middle active-Job identification bit.</td></tr>
<tr><td>25</td><td>JOB ID1</td><td>HIGH</td><td>Least-significant active-Job identification bit.</td></tr>
</table>

6 OPC UA Interface

In addition to the hardwire interface, each SBS control module provides an OPC UA server over its Ethernet connection. A machine controller, PLC, or other OPC UA client can use this server to communicate with the module directly, without the SB6500-Software. The module always operates as the OPC UA server; the customer's system connects to it as the OPC UA client. For example, UaExpert from Unified Automation is a free, general-purpose OPC UA client that can be used to browse the module's data and test the connection.

The main OPC UA server always listens on port 4845. The module also runs an OPC UA discovery server on port 4840. To connect, point the OPC UA client to the module's IP address on port 4845:

```
opc.tcp://<module IP address>:4845
```

By default, the module obtains its IP address through DHCP. If no DHCP server is available, it falls back to a link-local IP address (169.254.x.x). A static IP address may be set instead if desired. The module's IP address can be viewed and changed from the Network Settings screen (see Create Machine Group).

Discovery and connection range: Module discovery in the SB6500-Software (used when creating or editing a Machine Group) only works on a single local link. Modules on the other side of a router or on a different subnet will not appear in the Available Modules list. OPC UA connections do not have this restriction. An OPC UA client can connect to a module from any network that can reach the module's IP address, provided that port 4845 is not blocked by a firewall.

7 Troubleshooting Guide

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

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

Step 2 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. If you receive no reading from the Sensor during this test, the Vibration Sensor and Control Unit should be returned for repair. Contact Accretech SBS, Inc. for a return materials authorization (RMA) number.

Step 3 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. Activate the manual control interface, then 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 system 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, Control Unit, Vibration Sensor, and Balancer Cable should all be returned as a unit. Contact Accretech SBS, Inc. for a return materials authorization (RMA) number.

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. The sizing of the Balancer to the application should also be checked. *(see: Environmental Considerations section)*

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

7.1 Displayed Error Messages

Self-diagnostic software has been incorporated into all SB-6500 Series Control Modules. If a problem ever occurs with an SBS system, it is reported on the user interface 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 OK 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 CHECK RPM SENSOR	Checked continuously. Displayed if the RPM signal coming from the Balancer is below 25 RPM or exceeds 200,000 RPM.	Clears automatically. Verify the operating speed of the grinding machine. If the machine is running within the operating speed limits and this error persists, the RPM sensor in the Balancer or the Balancer Cable may have failed. Return the Balancer 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 the sensor is detected. Check sensor connections and try Power-On again. Continued error messages indicate the need to replace 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 power before checking cables, connectors, and the sensor for shorts. If the problem cannot be isolated, return the sensor, cable, and/or Control Unit for repair.

Error Code	Message	Definition	Action
D	MOTOR DRIVER FAULT SHORT – CHECK CABLE AND CONNECTORS – SEE MANUAL	Checked at the end of a motor pulse. Motor short circuit detected.	Cleared manually. Determine which component is defective by swapping parts with another system or by using the diagnostic test below. Return defective components for repair. If in doubt, return all items. **Test:** Stop the grinding spindle and disconnect the Balancer Cable from the Balancer, but not from the Control Unit. Press and hold the first manual motor button for 15 seconds. Repeat with each motor button, one at a time. If error E appears, clear it; this is expected. If no other error occurs, the problem is with the Balancer. If error D or F appears, continue the test. Disconnect the cable from the Control Unit and repeat with all four motor buttons. If no other error occurs, the problem is with the Balancer Cable. If error D or F appears, the problem is with the Control Unit.
E	MOTOR DRIVER FAULT OPEN – CHECK CABLE AND CONNECTORS – SEE MANUAL	Checked at the end of a motor pulse. Motor open circuit detected.	Cleared manually. Determine which component is defective by swapping it with another system. Return defective components for repair. If in doubt, return all items.
F	MOTOR DRIVER FAULT EXCESS CURRENT – PERFORM MANUAL FUNCTION TEST	Checked at the end of a motor pulse. Excessive motor current detected (short or stall).	Cleared manually or by pressing the Auto button. Verify that both ends of the Balancer Cable are properly attached. Clean contaminated connector pins with electrical contact cleaner. If the problem persists, test the Balancer Cable by swapping it with another system or by consulting the Balancer Cable Schematic with a voltmeter. This error can also be caused by motor or gear-train failure inside the Balancer. Return the defective cable or Balancer for repair.

Error Code	Message	Definition	Action
G	AUX POWER DEFECT SHORT – CHECK CABLE AND CONNECTORS – SEE MANUAL	Checked continuously. 24V Auxiliary Supply low – fuse open.	Clears automatically. Check cables and connectors for shorts and re-initiate the system check. Unplugging one cable at a time can help isolate the defective component. If the error persists, return the Control Unit and cables for repair.
H	RPM/CNC POWER DEFECT SHORT – CHECK CABLE AND CONNECTORS – SEE MANUAL	Checked continuously. 15V Auxiliary Supply low – fuse open.	Clears automatically or by pressing the Auto button. Check the Balancer and machine-controller interface cables and connectors for shorts, then re-initiate the system check. Unplugging one cable at a time can help isolate the defective component. Verify that any user-supplied interface cable is free of electrical shorts. If the error persists, return the Control Unit and cables for repair.
I	AUTO-BALANCE FAILED LIMIT NOT REACHABLE BEST BALANCE ACHIEVED AT:	Checked during the Auto Balance cycle. Auto Balance failed because the Limit could not be reached.	Cleared manually or by pressing the Auto button. Reset the PULSE setting to “CAUTIOUS” and verify system integrity as described in the Troubleshooting Guide. If the error continues, check the following: 1. The LIMIT may be too low. Set it at least 0.2 microns above measured background vibration. 2. The Balancer may be incorrectly sized for the application. Perform the test in the Verifying Balancer Size section and contact your SBS Balance System source if results are outside the suggested range.
J	NO RPM SIGNAL CHECK CABLES CHECK SPINDLE	Checked continuously. No incoming RPM signal; the RPM sensor circuit may be open.	Clears automatically or by pressing the Auto button. Ensure that the spindle is running and that the Balancer Cable is attached at both ends. Determine which component is defective by swapping it with another system. Return defective components for repair.

Error Code	Message	Definition	Action
K	ABNORMAL CONDITION BAL CYCLE COMPLETED AFTER ERROR DETECTED SEE MANUAL	Checked when the Auto Balance cycle completes. Balance completed with errors after an error was detected and cleared.	Cleared manually. No additional action is required.
L	CIRCUIT FAILURE UNABLE TO MEASURE VIBRATION – SEE MANUAL	Checked continuously. Signal acquisition circuit failed.	Clears automatically. No action is required other than clearing the error manually from the screen. If the problem persists, return the Control Unit for repair.
M	INTERNAL VOLTAGE ERROR	Checked continuously. A fault has occurred with one of the internal power supplies of the Control Unit.	Clears automatically. No action is required other than clearing the error manually from the screen. If the problem persists, return the Control Unit for repair.

7.2 Updating the SB6550 without the SB6500-Software

To update without using the user interface, place the update file for the display in the root directory on a FAT32-formatted USB drive and change the file extension from ".disp" to ".mender" (i.e. "updateFileName.mender"). While the display is powered, insert the USB drive into the front USB-C port of the display. The display will update. Do not remove the USB drive until after completion.

8 Support

For support, contact the machine builder or SBS at:

Accretech SBS, Inc.
2261 NW 28th Avenue
Portland, Oregon 97210 USA

Tel.: +1 503.595.4270
Fax: +1 503.595.4271
CustomerService@accretechSBS.com
https://accretechsbs.com/

9 Appendices

9.1 Appendix A: Specifications

Physical Features
Battery life (clock): 10 years
Service life – 10 years
SB-5500 Compatible
Operates with existing cables and sensors.
Interface adapter required to use SB-5500 hardwire cable.

Communication Interfaces
Ethernet TCP/IP (OPC UA), Profinet DP, CNC/PLC Hardwire Interface (opto-isolated outputs)

Power Supply
Input 22 VDC to 26 VDC.
SB-6518: 1.5A max at 22 VDC.
SB-6532: 6A max at 22 VDC.
Reverse voltage protected.
Connector: Phoenix Contact 1952034 or Eq.

44 Pin DSUB Connector Interface
CNC Digital Inputs and Outputs:
opto-isolated from system signals to at least 500V. Require common external 24VDC supply
Outputs:
active: drive up to 50 mA per output
inactive: high impedance down to -30 V referenced to the common.
Require flyback protection when driving coil.
Inputs:
-3VDC to 30VDC absolute max range.
Inputs are active with +18V to 30V DC applied relative to common active inputs draw 5ma @ 24V (4.8mA to 5.2mA).
Inputs are inactive with -3VDC to +5VDC applied relative to common.

Environmental and Installation
SB-6518/6532
Pollution degree 2
Installation category I
IP30
Environmental temperature range:
5°C to +55°C

SB-6500 Minimum Networking Requirements
Ethernet CAT6 shielded cable.
100Mbit/s unmanaged switch.

SB-6500 Software Minimum Computer System Requirements

- Processor (CPU): 2.8 GHz
- Memory: 8GB RAM
- Storage: 200MB
- Operating System: Windows 11 (x64), Windows 10 (x64) version 22H2, or Windows 10 Enterprise 2018 (x64) or newer.
- OS must be 64 bit.
- Graphics: 4GB Video Memory with 128MB VRAM

SB-6500 Software Features
Multi-language Capability
English, Japanese, Chinese Simplified, Chinese Traditional, Slovak, Czech, German, Polish, Turkish, French

9.2 Appendix B: Replacement Parts List

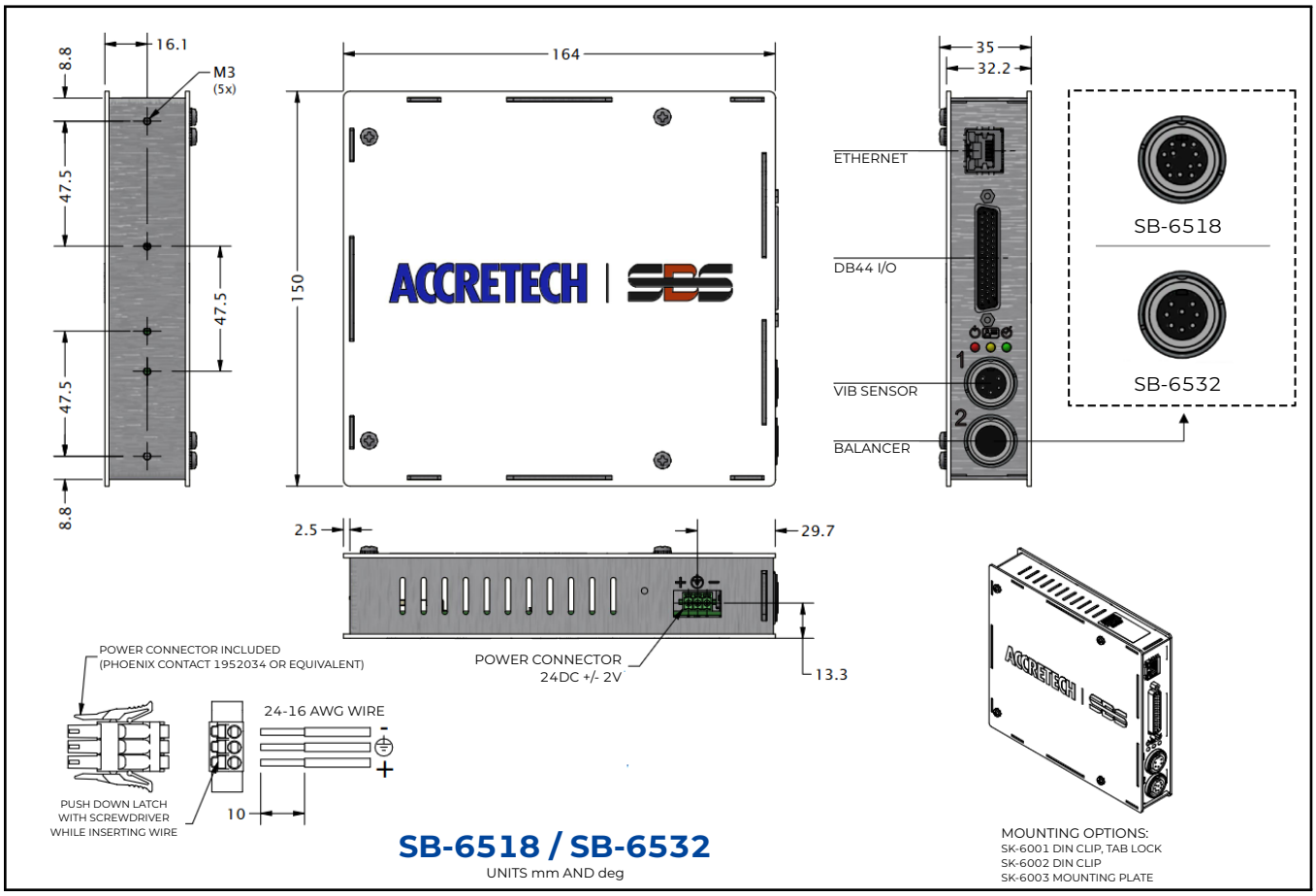
PN	Description
Balancer Cables	
SB-48xx	Balancer Cable
SB-48xx-V	Balancer Cable – Heavy Duty
SB-46xx	Balancer Extension Cable
Vibration Sensors	
SB-14xx	Sensor Cable (standard lengths)
SB-16xx	Sensor Ext. Cable (standard lengths)

Replacement sensors and cables can be identified by product tags on the product. Contact SBS for further information.

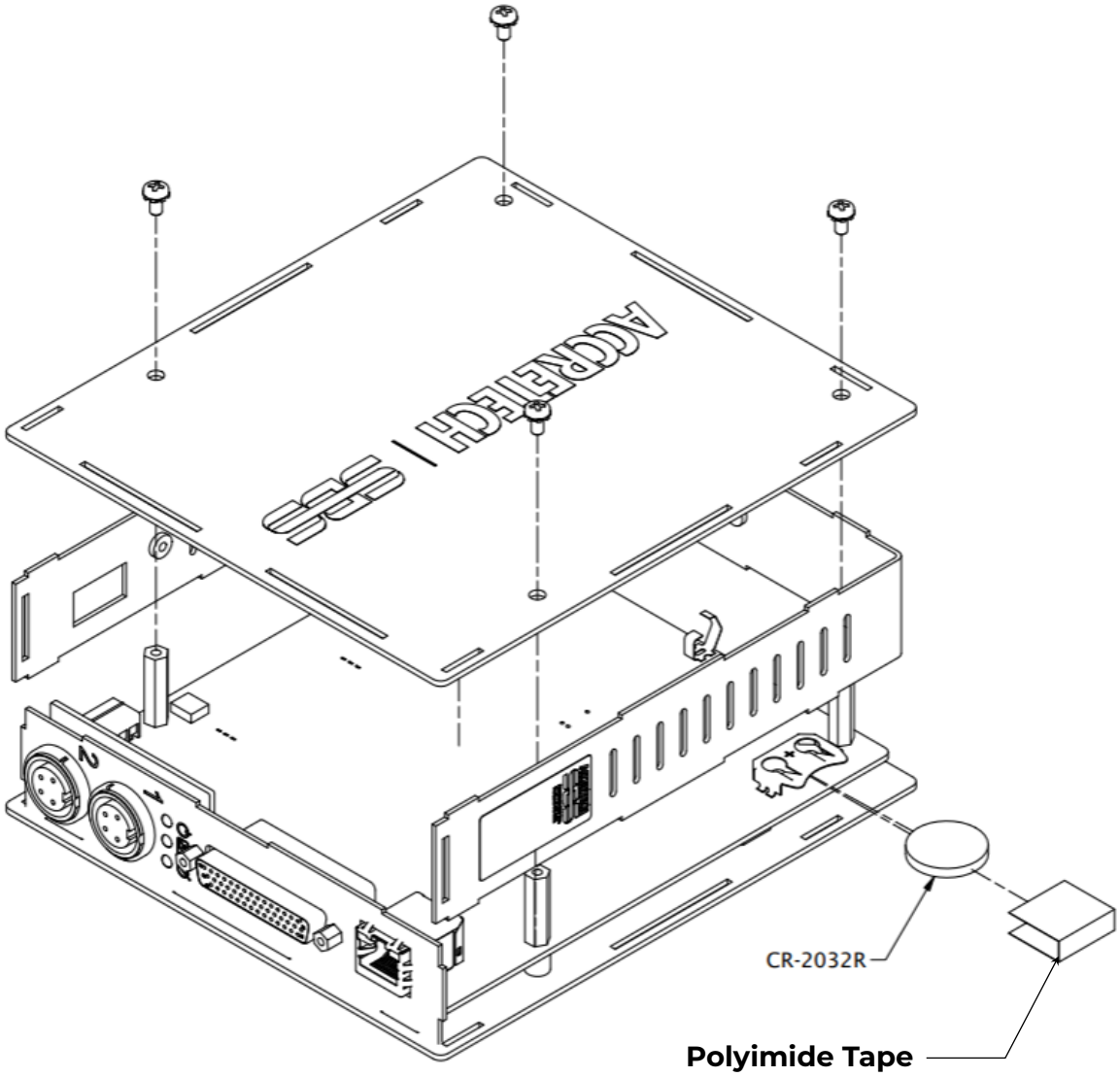
Control Mounting Options	
SK-6001	DIN rail mount clip: pull tab release
SK-6002	DIN rail mount clip: pivot release
SK-6003	Control Module mounting plate kit
Other Parts	
ED-0218	Power Supply Connector

xx in P/N = cable length in feet
Standard options 11 [3.5m], 20 [6m], or 40 [12m], e.g. SB-1411 = 11ft [3.5m]

9.3 Appendix C: Mechanical Drawings



9.4 Appendix D: Battery Replacement

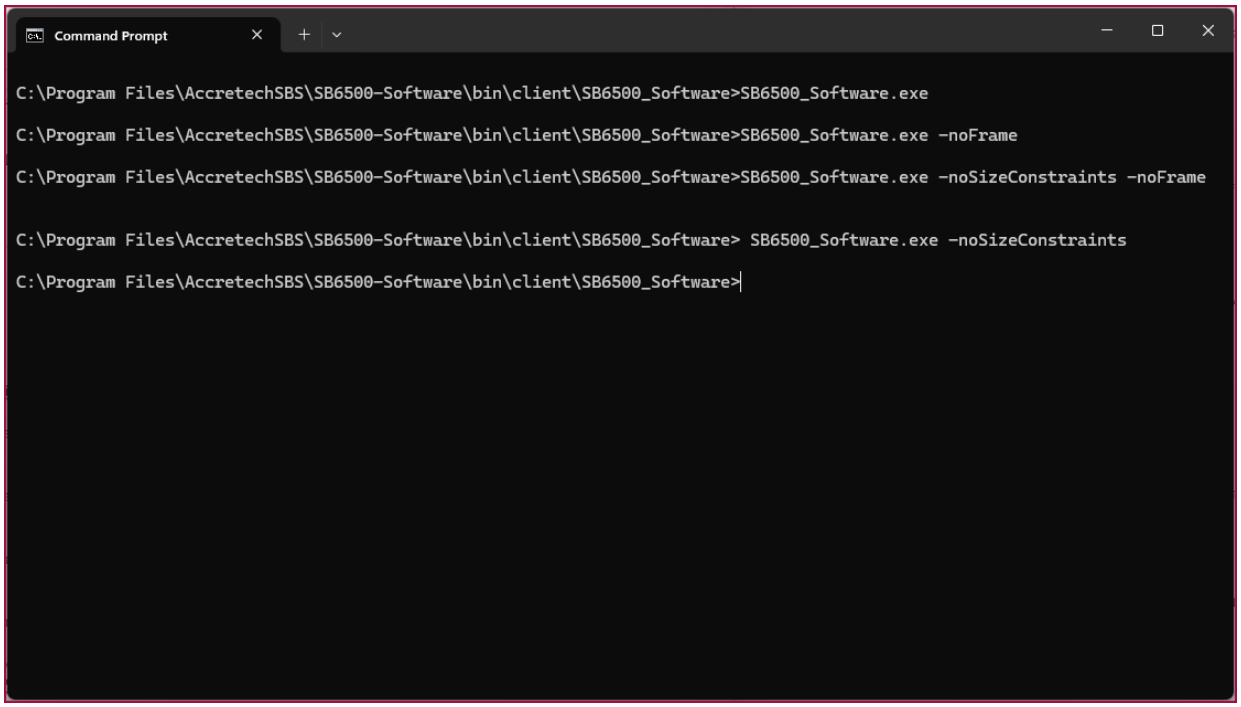


9.5 Appendix E: Command Line Options

If launching the SB-6500 Software from Command Prompt, the following options are available:

-noFrame	Removes the window frame
-alwaysOnTop	Sets the SB-6500 Software to always stay on top of other applications
-ipc	Activates -noFrame, -noAutoPos, -noAutoSize, and -noSizeConstraints
-noAutoPos	Disables the SB-6500 Software using the settings or passed in arguments to automatically position the window. This positioning code occurs after program launch, and this would be needed to manually set a position through other means.
-noAutoSize	Disables the SB-6500 Software using the settings or passed in arguments to automatically size the window. This sizing code occurs after program launch, and this would be needed to manually set a size through other means.
-noSizeConstraints	Removes the SB-6500 Software's size constraints, allowing its window to be resized by clicking and dragging or by setting a width and height through other means.
-fullscreen	Sets the SB-6500 Software to run in full screen. This disables the window frame as well and runs the SB-6500 Software taking up the entire space.
-pos	Followed immediately by 2 values, this sets the SB-6500 Software's position to the values passed directly after this. Example: -pos 400 500 would put the SB-6500 Software's upper-left corner at the coordinates x=400, y=500. Does not work if -noAutoPos is on.
-width	Followed immediately by a value, this sets the SB-6500 Software's width to the passed value in pixels. Note: Requires -noSizeConstraints to work. Does not work if -noAutoSize is on.
-height	Followed immediately by a value, this sets the SB-6500 Software's height to the passed value in pixels. Note: Requires -noSizeConstraints to work. Does not work if -noAutoSize is on.

Example:



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MODELS COVERED IN THIS MANUAL

SB-6518 SB-6532

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