



Phono 2-SB
Owner's Manual

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Owner's Manual for the LKV Phono 2-S

The 2-SB is a state of the art phono preamplifier which employs zero-feedback, fully differential (balanced) gain circuitry executed using only discrete jfets and bipolar transistors. It has all the elements that make a great phono preamp: very low noise and distortion, wide dynamic range, accurate RIAA equalization, Class A amplification and operating flexibility suitable for almost every audio system. The 2-SB will enable your system to convey to your ears the emotion, drama and beauty of the music on LP records. We believe you will love listening to music played through it.

A few minutes spent reviewing this manual will help you get the best possible performance from your Phono 2-SB.

1. Installation

The label affixed to the inside cover describes how your Phono 2-SB was configured at the factory, i.e., operating mode (balanced/single ended), gain setting, cartridge loading, and grounding options. If at the time of ordering you gave us the pertinent details of your system, we will have set your unit up to match that system. In this case, you can go ahead with the simple installation procedures described in this section. If you will be doing the system configuration yourself, you will likely find it helpful to read the both this section and the "Unit Configuration" section below before powering up your unit.

Locate the main amplifier enclosure on a firm, flat surface convenient to your turntable and line level preamp or integrated amplifier. Keep the cables from the turntable to the 2-SB as short as possible and make sure that they are well shielded and that the shield is grounded. Connect the umbilical cord from the power supply box to the "Pwr In" connection on the back of the main enclosure. See Figure 3, below. Plug the AC power cord from the power supply cord into a three prong, grounded AC outlet providing 115 Volts AC at 60 Hz.

The third (round) prong of the power plug must be connected to a proper ground whenever the Phono 2-SB is powered up. Never defeat that connection with a "cheater" plug or otherwise. A potentially lethal electric shock could be created if you do. As discussed below, the 2-SB is designed with other (safe) means of defeating ground loops that might cause hum.

Connect the cables from your turntable to the appropriate inputs on the back of the Phono 2-SB. **If you are operating in single ended input mode (see below) you will need to connect the ground wire from the turntable to the ground lug in the top center of the back of the 2-SB.** See Figure 3, below. In balanced input mode, the ground connection is made by the third prong of the XLR connectors, so you do not need to make a separate ground connection.

The Phono 2-SB produces very little heat, so you need not worry about ventilation. Induced noise can, however, be a problem given the very low levels of the signals that the 2-SB must amplify. Accordingly, the main enclosure should be located 18 to 24 inches away from sources of strong electromagnetic fields such as the 2-SB power supply box and other transformers, as well as electric motors. We have found that placing the 2-SB's main enclosure on a shelf immediately below a turntable does not seem to present any problem. That's it. Enjoy!

2. Unit Configuration

The Phono 2-SB is designed with operating options that allow it to mate well with almost all audio systems. This section describes those options and how to select among them.

2-A. Overview

The Phono 2-SB is comprised of two boxes: the main enclosure which contains two large circuit boards, one for each of the two stereo channels; and the power supply box, which contains the custom-made toroidal power transformer and a circuit board with rectifiers and large capacitors.

The main box. You will need to open this box to adjust gain and cartridge loading. **Before opening it, disconnect the umbilical power cord from the socket marked “Pwr In” on the back of the main box and wait 5 minutes for the capacitors to discharge. Doing so will reduce the chance of damage to the unit and protect against electric shock.** Then, remove the 4 Phillips head screws, two on each side of the cover flange and lift off the cover. Figure 1 shows a view from above of the interior of the main enclosure. Figure 2 shows one of the two, identical circuit boards. Marked on the figure are 5 functional areas: 1) power regulation and filtering, 2) input and first gain stage, including the headers and shunts used to set cartridge loading, 3) second gain stage, including the rocker switches used to set gain, 4) third gain stage, and 5) output stage. The only user adjustable items on the board are the headers with shunts in the input area and the small rocker switches in the second gain stage. Their use is discussed below in the sections on Setting Cartridge Load and Gain, respectively.

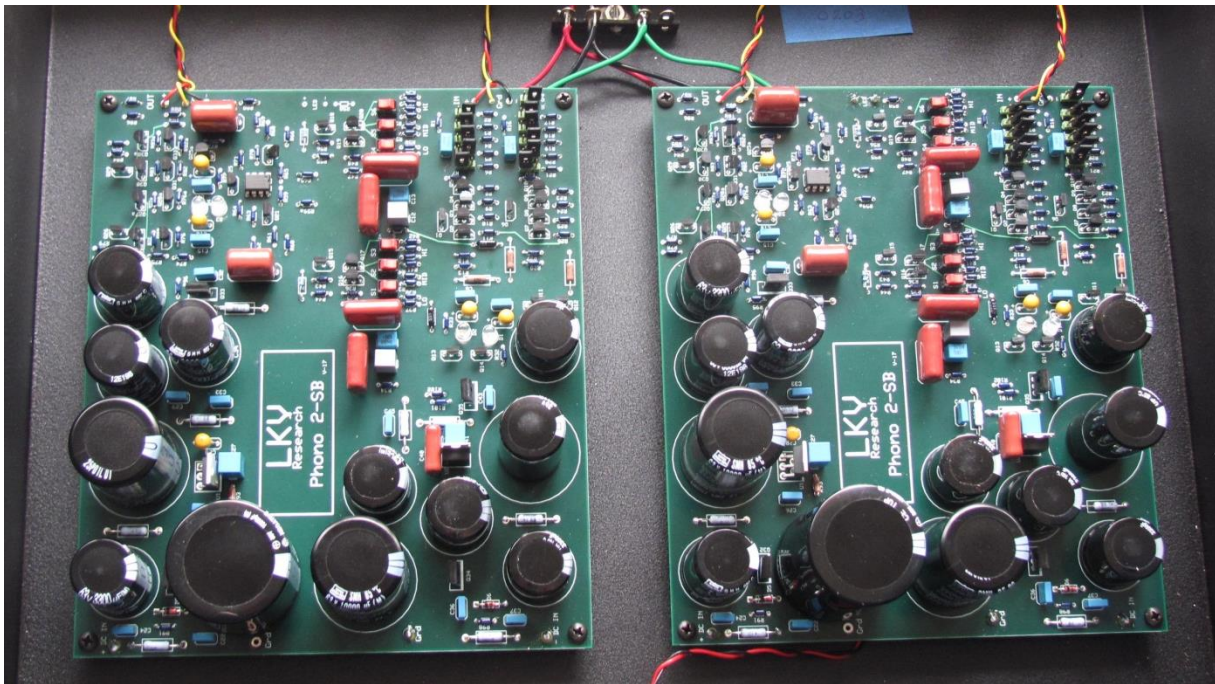


Figure 1 – top down view of interior.

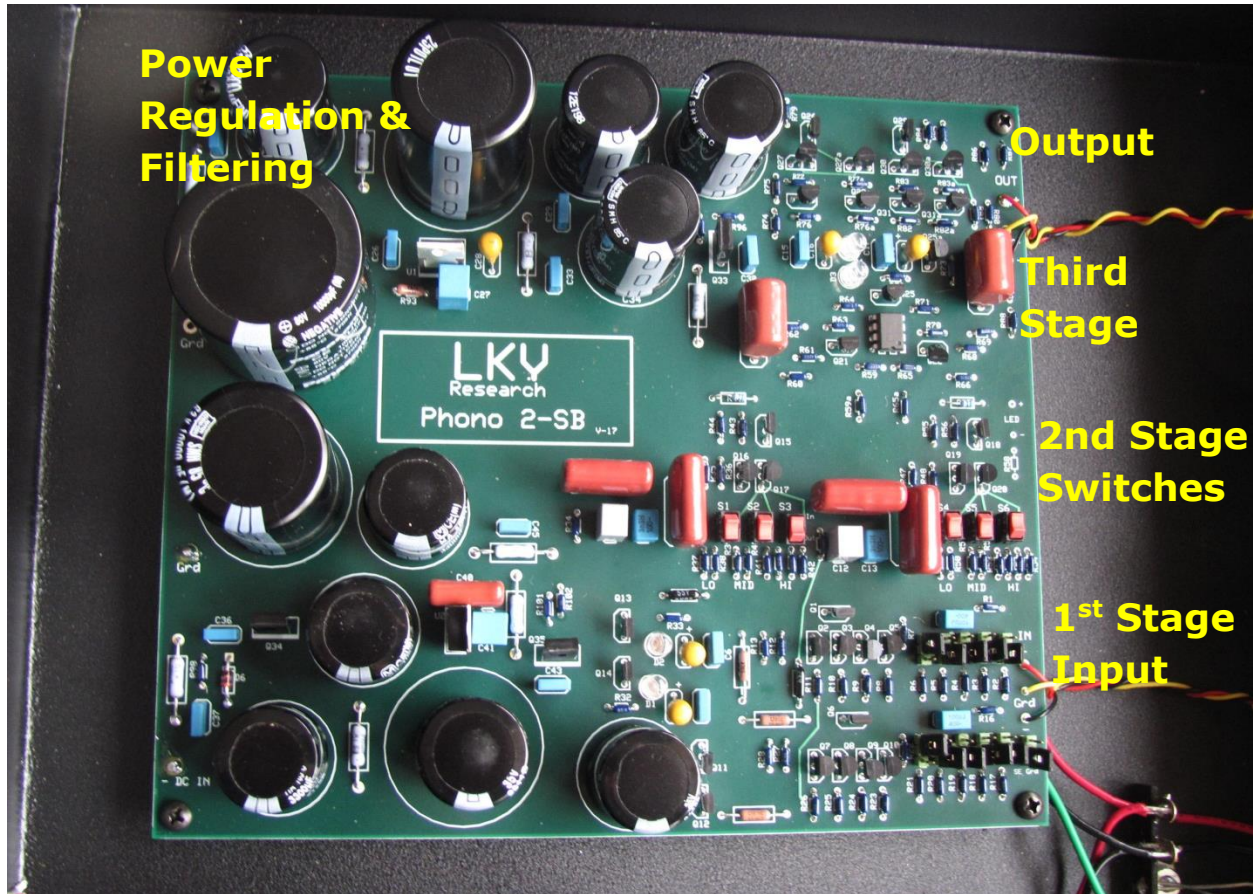


Figure 2 –Circuit board for one channel.

Figure 3 shows the rear of the main box. Note that there are four pairs of connectors, each with a single ended phono plug, a balanced XLR socket and a toggle switch. The use of these is discussed below under the heading Selecting Operating Mode.



Figure 3 – Rear panel showing connectors.

The power supply box. Figures 4-A and B show the two ends of this box. In Figure 4 A, note the power input connection, the power on and off switch, the fuse holder and the optional ground post. The fuse is accessed by turning the exposed fuse cap and pulling to extract the fuse. **Use only a 1.5 amp fast acting fuse. Use of any other type can create a danger of lethal shock and fire.** The use of the optional ground binding post will be covered in the section on Grounding, below.



Figure 4A – End of PS box with socket for power cord.

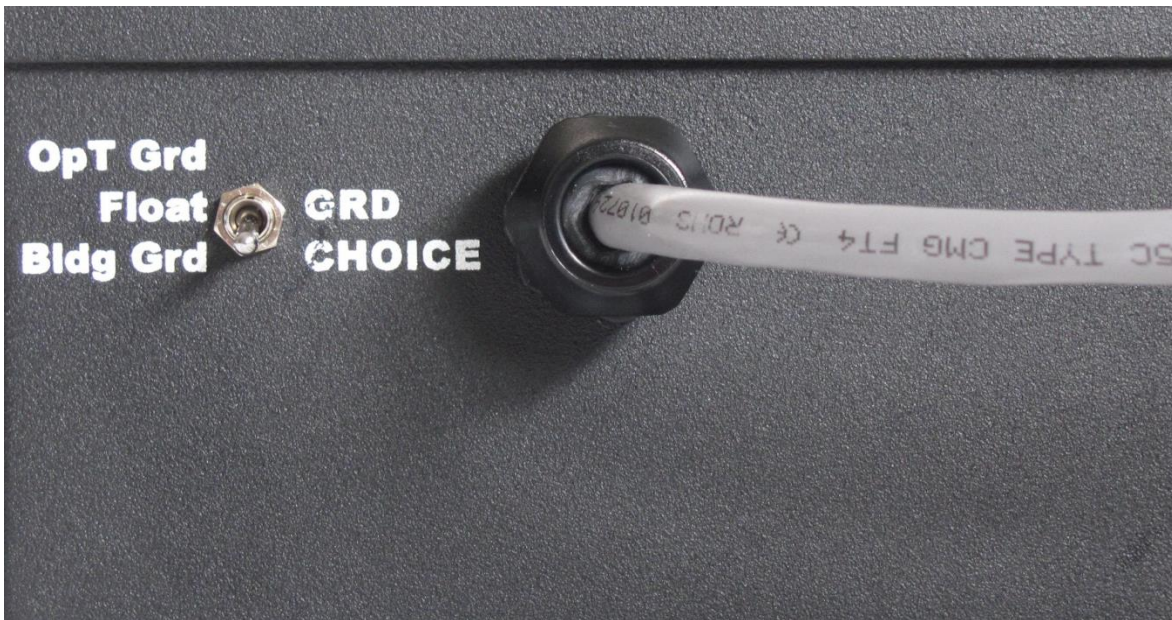


Figure 4B – End of PS box showing Ground Choice switch.

THERE ARE LETHAL VOLTAGES INSIDE THE POWER SUPPLY BOX AND NO PARTS THE USER CAN SERVICE OR ADJUST. THE USER SHOULD NOT OPEN THIS BOX. IF YOU SUSPECT A PROBLEM, REFER THE MATTER TO A COMPETENT TECHNICIAN OR CONTACT LKV FOR INSTRUCTIONS ON TO HOW TO PROCEED.

2-B. Selecting Operating Mode.

The 2-SB's inputs and outputs have both RCA phono jacks and XLR receptacles that allow the unit to accept and send on to the rest of your system either single ended or balanced signals. The unit can be operated in any of four modes:

- Single ended input and output.
- Balanced in and out.
- Single ended in/balanced out.
- Balanced in/single ended out.

Phono 2-SB readily accepts both single ended RCA phono plugs and balanced, three prong XLR plugs. **The unit should be turned off whenever you plug or unplug signal connectors.**

As shown in figure 3, there are 4 pairs of connectors (L and R inputs; L and R outputs) on the back panel of the unit. Each pair consists of one balanced XLR connector and one single ended RCA plug, along with one toggle switch. The 2-SB allows you to select balanced or unbalanced mode for each pair individually. To select balanced operation for one pair, just switch the toggle to the up position. To select single ended, switch it down. **When operating in single ended mode, you must connect your turntable's ground wire to the ground post on the top center of the back panel of the main enclosure. See Figure 3.** This connection is not necessary in balanced mode because the necessary ground connection is made by the grounding lug of the XLR plugs.

Changing the *input* mode of the 2-SB (balanced or single ended) will not change the 2-SB's gain. But switching from balanced to single ended output mode will reduce the overall gain by 6 dB. See Section 2-C for more details.

It is desirable to operate the Phono 2-SB in the balanced input mode to minimize noise. In laboratory conditions with inputs shorted, we measure no difference in noise levels between the two input modes. The 2-SB maintains its excellent low-noise performance under either condition. But, the noise cancelling ability of the differential first stage is lost when the input is single ended. Thus, if your turntable, tone arm or cables are picking up noise from their environment, it will be helpful to use balanced inputs so the first stage of the Phono 2-SB can cancel most of that noise before it gets into the rest of the circuitry. If this is not feasible, and you are experiencing bothersome noise levels, you will want to investigate ways to shield your front end and to eliminate sources of electromagnetic radiation in your environment.

It is feasible to retrofit most high end turntables for balanced mode operation. But the precise means of doing so without impairing the table's performance depends on the particular turntable. If you are interested in making this modification to your table, consider the effect it will have on any warranty, and then consult the table manufacturer or a dealer who knows his or her way around turntables.

2-C. Setting Gain.

The gain of the 2-SB can be adjusted for virtually all cartridge outputs. Three levels of gain (Lo, Mid and Hi) are available. Input mode, whether single ended or balanced, does not affect gain. But the output mode does. The following chart summarizes the overall gain at 1KHz for each of the three gain settings in balanced and single ended output modes.

Setting	Gain - Balanced Out	Gain SE Out
Hi Gain	59 dB	53 dB
Mid Gain	50 dB	44 dB
Lo Gain	40 dB	34 dB

Gain settings are selected using the small red rocker switches in the Second Gain Stage of each of the circuit boards in the main enclosure. They are shown in Figure 2 above and in close-up view in Figure 5, below.

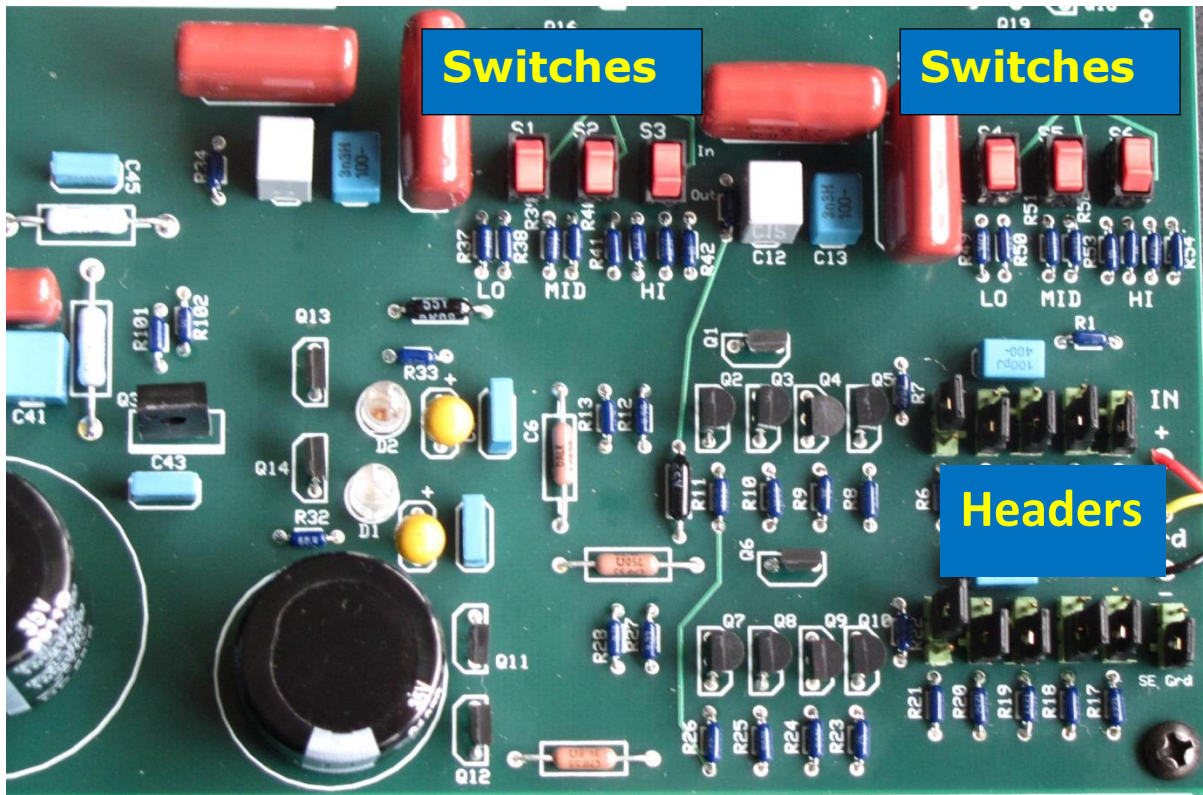


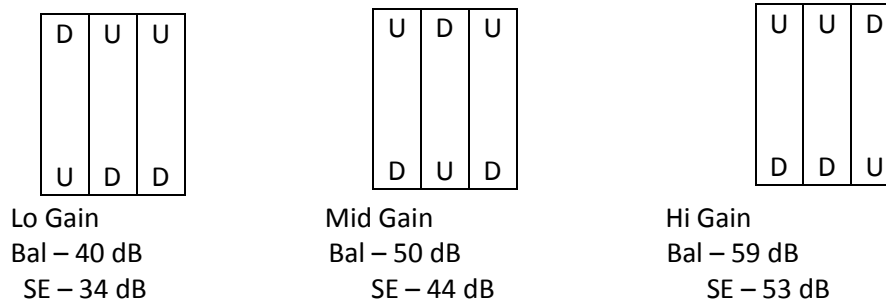
Figure 5 – Close-up view of gain switches and headers.

The diagrams below show how to configure the switches for HI, MID and LO gain. To set these switches you will need to follow these steps:

1. Disconnect the power umbilical from the main box, wait 5 minutes for the capacitors to discharge, and remove the top of the main box.
2. Orient the main box so the circuit boards in the box line up in the same direction as the board in Figures 2 and 5. One side of the box should be toward you and the front should be to your right.
3. Locate the 2 banks of three red rocker switches on one of the boards. You will first set one of these banks for the gain you want and then set the other identically.
4. The three diagrams below show how to configure one bank of three switches for each of the three gain settings. The rectangles represent the individual switches, and they are aligned the same as the switches themselves on the boards. Within each rectangle are the letters D and U. The end of the rectangle /switch that is to be pushed down is marked with the D; the end to be left up is marked with the U. You simply pick the set of rectangles labeled for the gain level you want, and set the switches in accord with the D and U markings.
5. Repeat step 4 for the second bank of switches on this first board.

Repeat steps 3 -5 for the second board.

Diagram for Setting Gain



Recheck to make sure that the settings on both boards are identical and match the diagram for the gain level you want. **It is important that all four banks of switches be set identically.** While there is no danger of damage to the 2- SB from operating it with non-identical gain settings, you likely will not enjoy the resulting sound.

We expect you will find that the Phono 2-SB has ample gain for almost any cartridge and system. Indeed, the most common problem users are likely to encounter is too much gain. The output voltage and current from most modern line level sources, including well designed phono preamps like the 2-SB are adequate to drive most power amplifiers directly. When signals of this level are fed into an active line stage preamp which itself has 5 to 10dB of gain, the power amp will be overdriven unless the signal is greatly attenuated before it is re-amplified by the preamp. In some systems the voltage output of the line preamp is actually *lower* than its input. This pattern of amplifying,

attenuating and re-amplifying imposes unnecessary noise and distortion on the musical signal. It is to be avoided if possible. Indeed, avoiding it is a cardinal principal of good analog design.

Unless you use a passive or buffer-only preamp, you can't avoid some attenuation and re-amplification. But you can minimize it by using the lowest gain setting in the Phono 2-SB that will allow you to achieve the sound levels you want from your speakers. We suggest setting your preamp's gain control well above the 12 o'clock position and then setting gain of the 2-SB to the lowest setting that gives you the loudness you want. Don't assume that because you have, for example, a moving coil cartridge you have to use the Hi gain setting. Our Chief Designer listens primarily to LPs played using a moving coil cartridge with a specified output of 0.3 mV at 1 KHz. The sound levels from his speakers are more than ample, even with his 2-SB set to "Mid" gain.

2-D. Setting Cartridge Loading

Cartridge loading refers to the resistance the cartridge "sees" at the input of the phono preamp. The 2-SB offers a wide variety of resistance values ranging from 50 ohms to 47.5K ohms:

Balanced input: 100/206/300/666/1K/2K/47.5K ohms.

Single ended input: 50/103/150/333/500/1K/47.5K ohms.

The 2-SB's 47.5K ohm setting will be right for most moving magnet cartridges. For moving coil cartridges, the resistive load from 50 or 100 ohms to 1K or 2K ohms can be used to tune the cartridge output.

Resistive load is adjusted using the headers and shunts found on the main circuit boards. These are shown and marked in Figures 2 and 5, above. The headers are the small, plastic blocks with three metal prongs sticking up. The shunts are the plastic caps that fit over two of the three prongs on each header. As shown in Figure 5, there are two banks of 5 headers and shunts on each circuit board. Each header connects to a corresponding load resistor; the load seen by the cartridge is determined by the positions of the shunts on the headers.

The following diagrams represent one bank of the headers and show the shunt positions used to set the various cartridge loads. **For proper operation, the shunts on all four banks of headers must be configured identically.**

The configurations of the shunts differ depending on whether the *input* of the 2-SB is operated in Balanced or Single Ended mode. (The output mode makes no difference for cartridge loading.) For this reason, the configuration diagrams shown below are divided into one group for Balanced mode and another for Single Ended mode.

Balanced Input Mode:

In the diagrams below, each 3 prong header is represented by a vertically oriented rectangle that is divided into three parts or boxes. Each box within a rectangle represents one of the prongs of the header. The rectangles are oriented to correspond to the way you will see the headers when you look at one of the circuit boards with one side of the box toward you and the front of the box to your right. This orientation is the same as that shown in Figures 2 and 5. To set a particular cartridge resistive load with the 2-SB in Balanced input mode, follow these steps:

1. Find the diagram below labeled for the cartridge load you want.
2. On one of the 4 banks of headers (2 on each circuit board), arrange the shunts as shown in the diagram. In each rectangle, the 2 squares with an "x" inside represent the prongs of the header to be covered by

the shunt. The square with the "o" inside represents the prong to be left uncovered. When pulling shunts off and pushing them onto headers, the key is firm, steady pressure straight up and down. The header prongs are pretty strong, but it is possible to bend them if you work at it. A pair of forceps or needle nose pliers will make this task easier.

- Repeat step 2 for each of the other 3 banks of headers.

Double check to see that all 4 banks of headers are identical and are configured in accord with the diagram you selected. Operating with the banks of headers in different configurations won't hurt the 2-SB, but the sound is likely to disappoint you.

Cartridge Load Chart for Balanced In Mode

<table border="1"> <tr><td>O</td><td>O</td><td>O</td><td>O</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>O</td></tr> </table> <p>100 Ohms</p>	O	O	O	O	X	X	X	X	X	X	X	X	X	X	O	<table border="1"> <tr><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr> </table> <p>206 Ohms</p>	O	X	X	X	O	X	X	X	X	X	X	O	O	X	X	<table border="1"> <tr><td>O</td><td>O</td><td>O</td><td>X</td><td>O</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>O</td><td>X</td></tr> </table> <p>300 Ohms</p>	O	O	O	X	O	X	X	X	X	X	X	X	X	O	X	<table border="1"> <tr><td>O</td><td>X</td><td>X</td><td>O</td><td>O</td></tr> <tr><td>O</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr> </table> <p>666 Ohms</p>	O	X	X	O	O	O	X	X	X	X	X	O	O	X	X
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Single Ended Mode.

To set cartridge loading for the single ended mode, perform the three steps described above, but use the following chart for arranging the shunts on the headers. In single ended mode, you need to align only the upper of the two banks of headers on each board.

Cartridge Loading Chart for Single Ended Mode

<table border="1"> <tr><td>O</td><td>O</td><td>O</td><td>O</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>O</td></tr> </table> <p>50 Ohms</p>	O	O	O	O	X	X	X	X	X	X	X	X	X	X	O	<table border="1"> <tr><td>O</td><td>X</td><td>X</td><td>X</td><td>O</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr> </table> <p>103 Ohms</p>	O	X	X	X	O	X	X	X	X	X	X	O	O	X	X	<table border="1"> <tr><td>O</td><td>O</td><td>O</td><td>X</td><td>O</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>X</td><td>O</td><td>X</td></tr> </table> <p>150 Ohms</p>	O	O	O	X	O	X	X	X	X	X	X	X	X	O	X	<table border="1"> <tr><td>O</td><td>X</td><td>X</td><td>O</td><td>O</td></tr> <tr><td>O</td><td>X</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>O</td><td>O</td><td>X</td><td>X</td></tr> </table> <p>333 Ohms</p>	O	X	X	O	O	O	X	X	X	X	X	O	O	X	X
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2-E. Grounding.

There are two ground connections in the Phono 2-SB. The **Safety Ground** connects the two metal enclosures (the power supply and amplifier boxes) together and to the third (ground) prong on the AC power cord. When that prong is plugged into a grounded, three-prong electrical outlet both boxes are grounded as a safety measure to prevent potentially life threatening electric shock. **This safety ground should never be defeated by use of a cheater plug or otherwise.** As explained presently, the 2-SB is designed with other means to void ground loop hum.

Circuit ground refers to the ground planes in each of two circuit boards in the main enclosure. You have three options as to how those ground planes are connected. Selection among these options is made using the three position toggle switch labeled "GRD CHOICE" on the power supply box. See Figure 4-B.

1. When the switch is in the down position (labeled "Bldg Grd") the ground planes in both circuit boards are connected through the third prong on the AC power plug to the ground in your building's electrical system. We have found that in most systems this option provides the lowest noise and best measured performance. We recommend using it as your default.
2. With the switch in the middle ("Float") position, the circuit board ground planes are connected to nothing but each other. In some systems floating the circuit ground may help eliminate ground loop hum and other noise.
3. With the switch in the up position ("Opt Grd") the circuit board ground planes are connected to the binding post labeled "Grd" on the opposite end of the power supply box. You may connect this post to a ground point of your choice. For example, if you use a "star point" ground for the rest of the components in your system, you can connect the "Grd" post to that point.

Experiment to determine which connection is best in your system.

3. Characteristics of the Phono 2-SB

The Phono 2-SB has all the elements needed to amplify and equalize with great fidelity the minute voltages produced by the cartridge as it traces the grooves on your vinyl records.

Very low noise and distortion allow all of the low level detail and subtle information encoded on the LP to flow to the rest of your system and to your ears. This information conveys much of the meaning and emotion of the music and contributes to creating a believable soundstage and solid, palpable images.

Dynamic headroom. Headroom is essential for accommodating the wide dynamic swings of music without strain or compression. In the 2-SB, it is achieved by using relatively high power rail voltages, biasing the active devices properly, and carefully adjusting the distribution of gain among amplification stages.

All discrete, Class A gain circuitry with zero loop feedback. While op amps and other circuits using feedback and "push-pull" amplification can produce good results, the best, most transparent, relaxed, musical sound still comes through well designed circuits, like those in the 2-SB, that achieve low noise and distortion without loop feedback. Each of the gain blocks is a true, noise cancelling differential amplifier. When the 2-SB is used in Balanced mode, the signal is never converted to single ended. Even when used in single ended mode, the 2-SB performs most amplification differentially.

Accurate RIAA equalization. The 2-SB uses a highly accurate, passive RIAA filter, composed of precision metal film resistors and polypropylene capacitors, to compensate for the boost of high frequencies and attenuation of the low end that is imposed when LPs are made. This accuracy is essential if the listener is to hear a valid reproduction of what the microphones at the original performance heard.

Listening. The final selection of components and the balance among the foregoing attributes was arrived at through many hours of careful listening and modifying numerous prototypes. The result is the Phono 2-SB, which we believe will deliver on our claim that it is "*designed to make music.*" We think you will agree.

4. Specifications.

Gain:

Balanced Out – 40/50/59dB

SE Out – 34/44/53dB

Input Impedance:

Varies from 50 to 47K ohms depending on cartridge load setting.

Output Impedance:

Balanced Out – Less than 200 ohms.

SE Out – Less than 100 ohms.

Signal to Noise Ratio (audio band, inputs shorted):

Balanced In/Out:

Better than 60dB s/n with 59 dB gain, Ref. to 0.5 mV input.

Better than 80dB s/n with 40dB gain, Ref. to 5mV input.

SE In/Out:

Better than 65dB s/n with 53dB gain Ref. to 1.0 mV input.

Better than 80dB s/n with 44dB gain, Ref. to 5mV input.

Total Harmonic Distortion (THD) at 1KHz:

Balanced Output: Less than 0.008% at 2.0V output.

Single Ended Output: Less than 0.008% at 1.0V output.

RIAA Equalization Error:

Less than +/-0.1% from 20 Hz to 50 KHz.

Crosstalk (5mV input at 10 KHz, one channel driven, Balanced and SE):

Better than -90dB (Right to Left and Left to Right)

Fuse: 1.5 Amp, Fast Acting

5. Limited Warranty.

LKV Research, LLC warrants LKV audio components to be free from defects in materials and workmanship for two years from the date the original purchaser bought the unit from an authorized dealer or through the LKV website. Normal wear and maintenance are not covered by this warranty. During the warranty period, LKV Research, LLC will repair defective units without charge subject to the following:

1. The unit must not have been altered or modified and must not have been damaged through misuse, abuse, accident, negligence or improper operation.
2. The unit, together with proof of original purchase, must be shipped to LKV Research or other service facility designated by LKV in packing adequate to protect it from damage en route with freight and insurance costs prepaid by the owner. Prior to shipping the unit, the owner must contact LKV to obtain a return authorization number. After repair the unit will be returned to the owner at any location within the United States, freight and insurance prepaid by LKV.

Where and to the extent permitted by law, the liability of LKV Research, LLC is limited to that provided by this warranty. **NO OTHER WARRANTY, EXPRESS OR IMPLIED IS MADE BY LKV RESEARCH. ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF "MERCHANTABILITY" AND "FITNESS FOR A PARTICULAR PURPOSE" ARE DISCLAIMED TO THE EXTENT THAT THEY EXCEED THE TERMS AND TIME LIMIT SET FORTH IN THIS WARRANTY. LKV RESEARCH SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Some States do not allow the exclusion or limitation of incidental or consequential damages, or the limitation of how long an implied warranty lasts, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights and you may have other rights that vary from State to State.

6. Contact Information.

For additional information or with any questions you may have, please contact LKV Research:

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