

S C I E N C E

A M P L I F I C A T I O N

S I S T E R

U S E R M A N U A L V . 1

Intro

Thank you for purchasing the Science Sister guitar amplifier! This manual goes over the different features of the amplifier, maintenance, tube, and warranty information as well as some general tube amp info.

Front Panel

Input jack: 1/4" for your guitar cable.

Channel switch (Normal/Overdrive): Switches between Normal and Overdrive channels. Overdrive channel includes: Overdrive Gain, rotary Depth control, and Overdrive Loudness. Normal Channel includes: Normal Gain, and Normal Loudness. Treble, Middle, Bass, Presence, and Resonance controls are shared and active for both channels. The Channel switch is over-ridden with the footswitch is plugged into the rear panel.

Overdrive Gain: Adjusts overall gain for the Overdrive channel. The more the control is turned up, the more overdrive will be produced.

Depth: 6-way rotary switch that adjusts the overall low end depth in the preamp for the Overdrive channel only. The most counter-clockwise setting provides the least depth, while the most clockwise produces the deepest tone. This control is highly interactive with the Gain, Bass, and Resonance controls, and can produce a huge array of tonal variations and break up characteristics. Experimentation is key!

Normal Gain: Adjusts the overall gain of the Normal channel. Turning the gain control up will result in subtle to a crunchy driven tone depending on the output of the pickups in your guitar.

Bass: Adds bass frequencies to both channels when turned clock-wise.

Middle: Adds midrange frequencies to both channels when turned clock-wise.

Treble: Adds treble frequencies to both channels when turned clock-wise.

Overdrive Loudness: Adjusts the overall volume of the Overdrive channel. Can be used to balance volume with the Normal channel.

Normal Loudness: Adjusts the overall volume of the Normal channel. Can be used to balance volume with the Overdrive channel. *Tip: For the cleanest tone possible, set the Normal channel Loudness maximum, and use the Normal gain to adjust the overall volume level. For the most overdriven sound possible from the Normal channel, set the Normal gain to maximum and bring up the Normal Loudness to the desired level.*

Presence: Adds sizzle, bite, and... "presence" to the tone when turned clock-wise, or cuts high

harmonics when turned counter-clockwise for a smoother tone. Affects both channels, but is more noticeable on overdrive settings when more high harmonics are present.

Resonance: Adds deep resonant bass to both channels. Lower settings provide a “tighter” low end response, while higher settings give greater low end response. *Note: This control is more effective with closed-back speaker cabinets, and even more exaggerated with larger enclosures and certain speakers.*

Off/Standby/Play switch (3-way): To turn on the amplifier, flip the switch from the down to middle position. The amp is now in Standby. Standby mode mutes the sound and allows the tubes to heat up before applying high voltage in Play mode. Leave in this mode for 30 seconds to a 1 minute before switching into Play mode (up position). Standby can also be used to mute the amplifier while leaving the tubes warm short breaks. For long breaks it is best to turn the amplifier completely off.

To turn off the amplifier, follow the same turn-on procedure in reverse – allowing the amp to idle in Standby mode for about 30 seconds before powering off. While it is perfectly okay to turn the amp off immediately, idling in standby before powering off lets the filter capacitors inside the amp fully discharge. If turned off immediately, there will still be some sound as the filter caps continue to discharge.

Rear Panel

120 VAC power input: Plug in the included standard IEC power cord here. For use with 120 VAC (USA) only unless otherwise specified.

WARNING!: Use with grounded power outlet only! Discard power cord immediately if ground pin is damaged/broken. The ground connection is for your safety in case of a fault!

Footswitch jack: Plug included 1-button footswitch here. Plugging in the footswitch overrides the front panel Channel switch.

Speaker Jacks and Impedance Selector

Note: Speakers must be rated for at least the full rated clean output power of the amplifier (100W). Under overdrive conditions, the clean power can be exceeded by tens of watts, therefore it is preferable to use speakers whose combine power rating exceeds the clean power rating. This topic is up for debate as some speaker manufacturers rate their speakers with this knowledge in mind (i.e. four 25W rated speakers may be OK for a 100W amp).

Using one speaker cabinet: With the amp OFF, match the impedance selector with the speaker cabinet's impedance. Always verify a speaker cabinets impedance before using with the amplifier. An impedance mismatch can potentially damage the amplifier.

Using two speaker cabinets: When using with two speaker cabinets, both must be the same impedance (i.e. two 8 ohm cabs), and the impedance selector should be set for half each cab's impedance. For example:

- When using two 8 ohm cabs: Set the impedance selector should be set to 4 ohms.
- When using two 16 ohm cabs: Set the impedance selector should be set to 8 ohms.
- Using two 4 ohms cabs: This configuration is not supported because there is not 2 ohm tap on the Sister's output transformer.

Effects Loop

The Sister's tube effects loop is designed to work ideally with instrument level effects (i.e. effects pedals) and some line level equipment (i.e rack effects units) gear. In general, time-based effects such as reverb and delay are best placed in the effects loop. The effects loop is located after the preamp section of the amp, where most of the overdrive is generated. This allows time-based effects to be operated cleanly. For example, plugging a delay into the effects loop allows you to delay your distorted tone, giving a clear delay effect. Conversely, plugging a delay into the input of the amplifier would overdrive the delay, giving a muddier washed-out delay sound. There is no correct way to use your effects, it's all a matter of preference.

The Return jack of the Effects Loop may also be used as a power amp input, and in conjunction with a separate preamp unit. When used in this fashion, both Presence, and Resonance controls will function normally.

Tip: A volume pedal also works well in the effects loop, acting as an overall master volume, which can be extremely useful in a live setting, however a buffered pedal is preferred to prevent volume/treble loss.

Send Jack: Connect to the input of your effects via 1/4" shielded instrument cable.

Return Jack: Connect to the output of your effects via 1/4" shielded instrument cable.

Footswitch

Switches between Normal and Overdrive channels. Plugging in the footswitch over-rides the front panel Channel switch.

Bias adjustments

Left bias adjustment: Controls the bias of the two left-most output tubes, V1 and V2 (See tube chart on pg. 12). The setting is locked in place by the outer locking nut. To make an adjustment, slightly loosen the outer locking nut.

Right bias adjustment: Controls the bias of the two right-most output tubes, V3 and V4 (See tube chart on pg. 12). The setting is locked in place by the outer locking nut. To make an adjustment, slightly loosen the outer locking nut.

Note: The 4 output tubes work in pairs; the left bias control adjust the bias voltage for V1 and V2, while the right control adjusts the bias voltage for V3 and V4. While the output tubes can only be adjusted in pairs, a test jack is provided for each individual tube to provide more accurate bias monitoring (e.g. trying to find a faulty tube).

Test jacks: For use with standard multimeter probes.

Black common probe jack: Plug in common meter probe here.

V1 red probe jack: Plug in probe to monitor V1 (See Tube Chart on pg. 12) output tube bias voltage.

V2 red probe jack: Plug in probe to monitor V2 (See Tube Chart on pg. 12) output tube bias voltage.

V3 red probe jack: Plug in probe to monitor V3 (See Tube Chart on pg. 12) output tube bias voltage.

V4 red probe jack: Plug in probe to monitor V4 (See Tube Chart on pg. 12) output tube bias voltage.

Bias procedure

WARNING!: Maladjustment of the bias controls can lead to output tube failure. The bias adjustments are not fool-proof, and output tubes can be under-biased because a reasonable bias range needs to be given to account for different output tube samples. If under-biased for a sustained period output tubes will likely fail. Science Amplification is not responsible for output tube failure due to mal-adjustment of bias controls.

Please familiarize yourself with the bias procedure before making bias adjustments. If you at all feel uncomfortable making adjustments, take the amp to a qualified technician. We do, however, encourage you to bias yourself because it is completely safe. It is also easy once you get the hang of it, and can save you quite a bit of cash!

Note: A electronic volt meter (digital preferred) with a millivolt setting is needed to make bias readings/adjustments. A digital multimeter can be found cheaply at any hardware store. Here's the cheapest we've found on the web, which is totally sufficient for the job:

<http://www.harborfreight.com/7-function-digital-multimeter-90899.html>

With a speaker cabinet plugged in, turn on the amp, let it warm up for about 30 seconds, then take off Standby into Play mode (The volume can be all the way down for the test). Let the amp run for a minute or two.

Next, set the multimeter to DC millivolts (mV).

Insert the black test probe into the black jack on the rear panel, and the red probe into any of the red jacks.

Note: The 4 output tubes work in pairs; the left bias control adjust the bias voltage for V1 and V2, while the right control adjusts the bias voltage for V3 and V4. While the output tubes can only be adjusted in pairs, a test jack is provided for each individual tube to provide more accurate bias monitoring (e.g. trying to find a faulty tube).

For the correct bias range you should read between:

- 32mV to 39 mV per tube when using **EL34s**
- 39mV to 46mV per tube when using **6L6s**
- or 46mV to 53mV per tube when using **KT88s**

Anything lower settings will not harm the tubes, but anything higher than:

- 43mV and up per tube for **EL34s**
- 52mV and up for **6L6s**
- 61 mV and up for **KT88s**

will lead to shortened output tube life or imminent failure.

Remove the red probe, and insert it into the other jack to check the reading. Ideally it should be the same as the first reading, but a couple millivolts difference is no big deal.

Here are some situations where you may need to check the bias:

- The amp sounds thin, or abnormal in any way.
- The amp is quieter than normal.

- The amp hums more than normal.
- The bias controls are accidentally maladjusted.

If a reading is below the safe range by more than 10-15mV, then it's likely a tube has failed on that side and needs to be replaced. This will also cause the other side to be higher than normal.

The output tube pairs will also age unequally (much like car tires), so some may adjustment may be needed through out the tubes' life to keep them in balance. Although it's not necessary to keep the pairs balanced, it will keep the amp putting out maximum output with the least amount of hum.

If adjustment is necessary, first loosen the outer lock-nuts on the bias adjustments. Make move the control with a flat-head screwdriver (a guitar pick works well too), while monitoring the number on the multimeter. You may have to adjust both controls back and forth until they are balanced because they are somewhat interactive.

Tube life and troubleshooting

Output tubes (V1, V2, V3, and V4 – See tube chart on pg. 12) generally produce a good strong sound for 6 months to a year when played regularly, then they may become dull sounding, and/or the amplifier may begin to loose some power. Power may last much longer depending on how hard the amp is played. Sometimes they die gently, sometimes abruptly causing a fuse to blow, which in turn protects the amplifier from further damage. Output tubes may also become microphonic like preamp tubes.

It's sometimes possible to see which power tube(s) is damaged. If necessary, remove the output tubes to inspect them (Remove power cord, allow tubes to cool, then grab by the plastic base, and gently pulling up in a circular motion). Here are things to look for:

- Shiny silver area on top of tube turns white.
- Burned spot on the large gray structure inside the tube.

Sometimes a output tube or preamp tube will become “microphonic” when something becomes physically loose inside the tube's glass envelope. In turn, this noise then gets amplified through the speaker. The noise can be anything from static, a high-pitched ringing, or intermittent sputtering noises. This is usually exacerbated by vibration from the speaker cabinet. If you think a tube may be microphonic, try isolating the amplifier from the speaker cabinet.

Tip: If you think you have a microphonic tube, you can very gently tap on each tube with a pencil's eraser to see if the sound becomes worse or changes. All tubes will amplify the sound a little, especially preamp tubes. But for example, if you hear an intermittent ringing sound and tap each tube to find V9 is causing the ringing to start and stop, you can be sure it's the problematic tube!

In general preamp (V9, V8, V7), phase inverter (V6), and effects loop (V5) tubes (see tube chart on pg. 12) can last many years, and usually become microphonic before wearing out or failing.

Changing preamp, effects loop, and phase inverter tubes

V5, V6, V7, V8, and V9 (see tube chart on pg. 12)

Push down and gently twist remove the aluminum shields over the preamp, etc. tubes. To remove tubes, gently pull upward using a very slight circular motion if necessary. When re-inserting a preamp tube, mind the pin/socket orientation as they are “keyed” to insure proper installation.

Changing output tubes

V1, V2, V3, and V4 (see tube chart on pg. 12)

CAUTION!: Tubes can become extremely hot during normal operation. Make sure the amplifier is OFF, and always allow tubes to cool before handling to prevent burns.

In general, it's best to change all 4 output tubes at once (V1, V2, V3, and V4 – See tube chart on pg. 12), and preferable to buy a "matched quad" from a reputable dealer. However, because of the dual-bias system, it is possible to replace only one pair of output tubes with a "matched pair," then balancing the bias level with the old pair.

Tip: Buy “burned-in” tubes when possible for maximum stability and minimal bias drift.

To change tubes, remove the old tubes and set both bias controls all the way down (counter-clockwise). Insert the new tubes minding the “key” on the bottom of the tube, and slowly bring up both bias controls until they are equal and in the safe bias range.

If tubes are not pre-“burned-in,” check the bias after playing to see if it has drifted from the initial setting. Full burn-in may take up to 24 hours depending on the tube set. This is why burned in tubes are preferred.

Different tube types and bias ranges

The Sister can use either EL34, 6L6 tubes, or KT88 output tubes (however not mixed together). Below are the correct bias ranges for all tube types:

For the correct bias range you should read between:

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- or 46mV to 53mV per tube when using **KT88s**

Anything lower settings will not harm the tubes, but anything higher than:

- 43mV and up per tube for **EL34s**
- 52mV and up for **6L6s**
- 61 mV and up for **KT88s**

will lead to shortened output tube life or imminent failure.

Fuses

WARNING: Only check/change fuses with amplifier unplugged from the wall socket!

Fuses are user-replaceable, and if a fuse needs replacement, always replace with the correct "T" type and rating. The "T" stands for "Time delay" also known as "Slow Blow." Also be sure to use the correct amperage rating (Ex. 1A = 1 Amp). These fuses are the 3AG type and are commonly available. The correct fuse values are located on the back panel of the amplifier.

If a fuse blows, it's a good thing! Fuses are put in place for safety and to protect the most expensive parts of the amplifier. Fuses can blow for various reasons, however the most common is a output tube failure. To check if a fuse is blown, push and twist counter-clockwise to remove the fuse holder and see if the small wire inside the glass is broken. There may also be a burnt area the inside of the glass.

If you replace a fuse, and it blows again, there is likely a more serious problem. Please contact us before changing the fuse again at info@scienceamps.com so we can further assist you with the trouble-shooting.

Safety

- Always use a 3-prong cable into a grounded outlet. This makes sure the amplifier is always grounded and safe in the rare occurrence the chassis should become "live" (electrified).
- Tubes become very hot during normal operation. Allow them to cool before handling to prevent burns.
- Never change tubes with the amplifier ON.

- Always make sure the amp's vents are open, allowing heat to escape and air to flow freely.
- Keep the amp away from moisture, and never put any beverages on top of the amplifier, no matter how convenient it may seem!
- Only change fuses with the amp unplugged from the wall!
- There are potentially lethal voltages present inside the amplifier. Do not open the amplifier chassis unless authorized and are a qualified technician.

Limited Lifetime Warranty

Science Amplifiers are warranted to be free from defects in workmanship for the lifetime of the original owner. Electronic components such as capacitors, resistors, transformers, jacks, and potentiometers are warranted for 5 years (not including tubes, see below). Any part determined defective by Science Amplification within the 5 year period shall be repaired or replaced by Science Amplification without charge for parts and labor provided the unit is returned and transportation costs prepaid. Science Amplification will pay return shipping costs to the original owner. Any unauthorized repair, modification, or tampering voids this warranty.

The warranty excludes:

- Normal wear and tear: worn out tubes, jacks, cosmetic damage, etc.
- Misuse and abuse: operating the amp without a speaker connected (although the amp has some built-in protection against this), operating the amp into the wrong speaker load, improper tube installation, using the wrong value fuses, maladjustment of bias controls, etc.
- Accidental damage: Dropping the amp, spilling liquid inside, etc.
- Acts of "God": Natural disasters and other non-preventable/foreseeable events that damage the amplifier.
- Tubes, unless within manufacture's warranty period of 90 days (replacements offered at manufacturer's discretion).
- Any damage caused by authorized or unauthorized repair or modification that is not performed by Science Amplification.

Speakers carry Eminence's 7-year manufacturer's warranty. The terms can be found here: <http://www.parts-express.com/docs/warranty/eminence-manufacturer-warranty.pdf>

If you think you have a speaker problem, please contact us first.

For warranty service, please email info@scienceamps.com for return authorization. Amplifiers must be sent back in the original packaging or equivalent packaging. The cost of return shipping to Science Amplification is to be prepaid by the owner. Science Amplification is not responsible for damage caused in return shipping. Science Amplification will pay for the return shipping after the warranty work is completed.

In general, we will be able to fix your amp for free, and help with tube changes, etc. if needed. We will also be happy to modify the amp in any way possible until the amp is perfect for you. Non-warranty repair is also available – please inquire for shop rates.

Don't hesitate to contact us!

Care and Maintenance

If plexiglass panels need cleaning, use only a soft clean, and dry 100% cotton cloth to wipe off smudges with just a little pressure to avoid scratching. If needed dampen the cloth with a little water, or use Novus brand plastic polish. Avoid harsh alcohol-based cleaning products as they may cause the acrylic to “bloom.” Also avoid the ubiquitous “microfiber” cloths, which can leave lint and/or tiny scratches the plexiglass in some cases since they vary so greatly in quality.

Periodically check the 4 mounting screws on the bottom to make sure they are tight. These screws secure the chassis to the head cabinet, and also insure contact to the aluminum RF shielding plate inside the cabinet.

If possible, move the amplifier when the tubes have had the chance to cool down for a couple minutes. Because the tubes get very hot, the elements inside become more vulnerable to physical damage until the tubes have cooled. In general, try to move the amp off stage last.

Tube Chart

Birds-eye view of the Sister's tube layout. Only replace tubes with specified types listed below:

