

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

MOTHER

USER MANUAL V.2

Intro

Thank you for purchasing the Mother amplifier for bass or guitar! 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

Normal Channel Input Jack (NOR): 1/4" jack for your guitar or bass. This input excels at clean tones as well thick classic crunch. When plugging into this input only the **Gain** control is active.

Overdrive Channel Input Jack (OD): 1/4" jack for your guitar or bass. This input can produce tones from clean all the way up to high gain saturation. When plugging into this input both the Drive and Gain controls are active and work in unison.

Drive (only active when plugged into OD input): This control adjusts overall drive/level of the amp's first two gain stages. Think of this control as driving the input of the Normal channel, much like plugging in an overdrive pedal into the front of the amplifier (but better, of course). The more the control is turned up, the more overdrive will be produced.

Gain: Controls the overall gain of the Normal channel. When plugged into the Overdrive channel this control is used in unison with the Drive control to obtain a multitude of tones and levels of overdrive.

Tip: When using the the Overdrive channel for distorted tones, start with the Gain control at 12 o'clock and turn up the Drive to the desired level, then increase the Gain for even more saturation. For cleaner sounds from the Overdrive channel, start with both controls below 12 o'clock.

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

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

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

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

Loudness: Adjusts the overall volume of both channels as well as drive to the power amp.

Presence: Adds sizzle, presence, and bite to the power amp section of the amplifier when turned clockwise. Turning counter-clockwise can smooth-out the tone.

On/Off switch: Turns the amplifier on and off.

Standby/Play switch: With the amplifier ON, Standby mode mutes the sound and allows the tubes to heat up before applying high voltage in Play mode. Leave in Standby for 30 seconds to a 1 minute before switching into Play mode. 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!

Speaker Jacks and Impedance Selector

*Note: Speakers must be rated for at **least** the full rated clean output power of the amplifier (200W). Under overdrive conditions, the clean power can be exceeded by 100W (i.e. 325W!) 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 in mind (i.e. four 25W rated speakers may be OK for a 100W amp).*

Always verify a speaker cabinets impedance before using with the amplifier. An impedance mismatch can potentially damage the amplifier.

Using one speaker cabinet: With the amp OFF, plug in speaker cabinet either Speaker Out jack.

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 Mother's output transformer.

Slave/Line Out Jack (unbalanced): Connect to the input of an additional amp/power amp and speaker cabinet, or any line level input (i.e. mixing console) via 1/4" shielded instrument cable.

Slave/Line Out Level: Use this control to adjust the output level. Start with control at full counter-clockwise and turn up until the input to clipping or desired level for the receiving/slave unit.

Bias adjustments and bias test points

Bias adjustments: V1-V4 bias adjustments individually control the bias for all the Mother's four KT88 power tubes. The bias setting is locked in place by the outer locking nut. To make an adjustment, slightly loosen the outer locking nut.

Test jacks: For use with standard multimeter probes

Ground 1: Plug in common meter probe here to check bias for V1, V2

V1 red probe jack: Plug in probe to monitor V1 (See Tube Chart on pg. 10) output tube bias voltage.

V2 red probe jack: Plug in probe to monitor V2 (See Tube Chart on pg. 10) output tube bias voltage.

Ground 2: Plug in common meter probe here to check bias for V3, V4

V3 red probe jack: Plug in probe to monitor V3 (See Tube Chart on pg. 10) output tube bias voltage.

V4 red probe jack: Plug in probe to monitor V4 (See Tube Chart on pg. 10) 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 Ground 1 jack on the rear panel, and the red probe into the V1 red jack.

Note: The 4 output tubes work in pairs; the left bias control adjusts the bias voltage for V1 and V2, while the right control adjusts the bias voltage for V3 and V4. Although 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).

The Mother uses KT88 output tubes. The correct bias range is **31 mA** to **38 mA** per tube. Anything lower settings will not harm the tubes, but anything higher than **42 mA** will lead to shortened output tube life or imminent failure.

Remove the red probe from the red V1 jack, and insert it into the V2 jack to check the reading. Ideally it should be the same as the first reading, but a couple millivolts difference is no big deal. Repeat the procedure for V3 and V4 by plugging the black multimeter probe into Ground 2 and the red probe into the red V3 and V4 jacks.

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 possible a tube has failed on that side and needs to be replaced. This will also cause the other side to be higher than normal by a similar margin.

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) 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. Output tubes 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 in plain view 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 shallow circular motion). Here are things to look for:

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

Sometimes an 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 to see if the noise stops.

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 V8 is causing the ringing to start/stop, you can be sure it's the problematic tube!

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

Changing preamp tubes

V5, V6, V7, and V8 (see tube chart on)

For V8, gently push down and twist the aluminum shield to remove. 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)

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), 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," and 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.

Bias range

The Mother uses KT88 output tubes. The correct bias range is **31 mA to 38mA** per tube. Anything lower settings will not harm the tubes, but anything higher than **42mA** 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 Mother's tube layout. Only replace tubes with specified types listed below:

