

INSTRUCTION BOOK



A Digital Readout for Real World Analog Measurements

As tubes age, their bias point will shift. By using the BIAS KING™ you can maintain the sound you want by periodically checking the bias for your amp. This will help to maintain a consistent tone and ensure the longest tube life possible.

NOTE: BIAS KING™ products require the amp to provide 6.3 volts AC (heater voltage) between pins 2 & 7, and that the tube cathode be on pin 8. Some amps use DC heater voltage, which will not power the BIAS KING™.

**There are two models of the BIAS KING™
covered by this instruction book:**

BIAS KING™

An economy model, with only one molded tube socket, designed for people who usually buy their tubes already matched.

BIAS KING PRO™

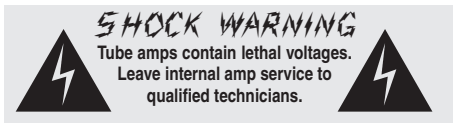
A deluxe model featuring two molded tube sockets, designed for technicians and people who prefer to match their own tubes.

www.biasking.com

Before You Begin...

Read over these notes and helpful hints before you begin using your BIAS KING™:

- The BIAS KING™ will not and does not adjust anything in your amp. It is an indicator used to “see” how much current is flowing through the tube so a technician can make the necessary adjustments. The more current that flows through your tubes, (higher number on the BIAS KING™) the hotter they run. This is because they are dissipating more heat. Conversely the less current, the cooler they run and the longer the tube life. Therefore, running your tubes at the lower number on the BIAS KING™ and still getting the sound you want will improve reliability and assure you of the maximum tube life you expect.
- Make sure the guide pin is lined up with the socket (breakage is not covered by the warranty)
- Never touch the hot glass of a tube. Always hold tubes by the base to prevent burns and glass breakage. **ALWAYS HOLD THE TUBE BY THE BASE.**
- Do not plug the BIAS KING™ socket into a rectifier tube socket.
- Some Music Man Amps use a different circuit that draws much less current (6-10mA), so the formula will not work for them.
- Let the tubes warm up for about 2 minutes before taking a reading.
- Always use your standby switch when turning on your amp. It will help your tubes last longer.
- If the reading on the BIAS KING™ starts going up above “100.0” when you turn your standby switch on, turn the standby switch back off and make sure the tube is not shorted. This could also indicate a problem with the bias circuit and should be checked by a qualified technician. Damage to the BIAS KING™ from either of these conditions is not covered by the warranty.
- All BIAS KING™ readings should be taken with the standby switch in the “operate” or “on” mode and with no signal into the amp—all volume controls turned all the way down. Make sure speaker or appropriate load is connected to amp.
- The BIAS KING™ display has a maximum range of **199.9 mA**. Any current reading over this is indicated by a blank screen with a “1” on the far left hand side.
- If the tube draws more than 200 mA this usually indicates a serious problem. Turn OFF the amp immediately until you can have it checked out by a qualified technician.



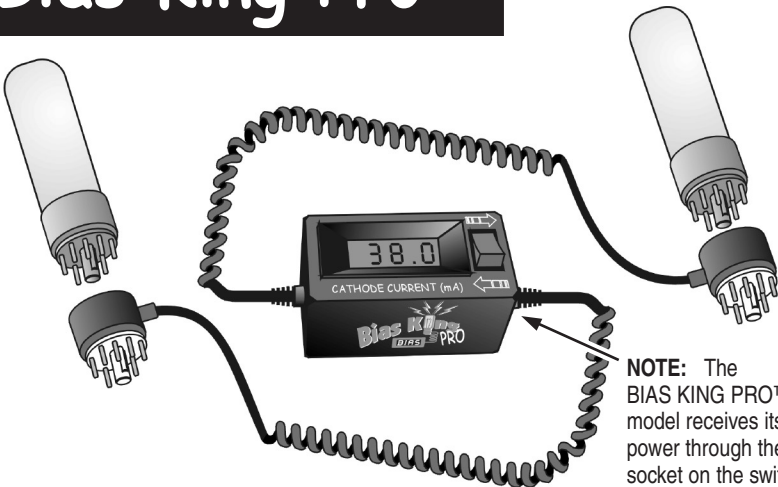
Bias King™



Meet the Kings...

Both units operate identically. However, the BIAS KING™ has one tube socket, while the BIAS KING PRO™ has an extra socket and a switch to select which socket is displayed on the readout.

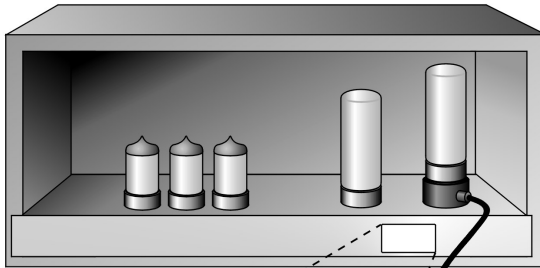
Bias King Pro™



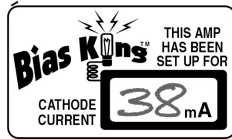
The BIAS KING PRO™ is very convenient when used for matching tubes into pairs. The dual socket arrangement and switch allow for quick and easy comparison of two tubes.

NOTE: The BIAS KING PRO™ model receives its power through the socket on the switch side of the box. Always make sure this socket is plugged into the amp.

Connecting the Bias King™ to your amplifier....



NOTE:
Make sure speaker or appropriate load is connected to amp.



1. With the amp turned off, remove output tube from amp.
2. Place the BIAS KING™ molded socket into amp, taking care to make sure the “key” on the base lines up correctly.
3. Insert tube into the BIAS KING™ molded socket, again, making sure the “key” on the base lines up correctly.
4. Turn on amp, but leave on “standby.” The BIAS KING™ display will power on at this point. After a 2-minute warm-up, turn the amp from “standby” to “on.”
5. As you turn the amp from “standby” to “on,” watch the BIAS KING™ display. If the reading starts going above “100.0” switch the amp back to “standby” and make sure the tube is not shorted, or there is not another problem.
6. After hooking up the unit according to the above steps--making sure that there are no problems--follow the specific instructions on the following pages for taking the bias reading (using the BIAS KING™ or BIAS KING PRO™).
7. Stickers have been provided with the BIAS KING™ so that once the bias is set to the correct point, you can write the number down and stick it on the amp. The next time the tubes are replaced in this amp, set the bias back to the Cathode Current number on the sticker and your amp will sound the same.

More stickers may be obtained from Ambient Sound; see address on back of book.

Instructions for using both the Bias King™ and Bias King Pro™

NOTE: *Both units operate identically. However, the BIAS KING™ has one tube socket, while the BIAS KING PRO™ has an extra socket and a switch to select which socket is displayed on the readout.*

Be aware that the bias point is subjective.

The bias point of any amp is somewhat subjective. Within a certain LOW and HIGH range, where the tube will not operate in the cutoff region or exceed the maximum plate dissipation, any setting that sounds good to you is acceptable. We recommend the lowest setting that still sounds good to you. This will increase tube life and reliability.

To find the reading on the BIAS KING™ for a tube type in your amp:

1. You will need to find two numbers: the LOW bias point and the HIGH bias point.

To do this, you must know the cathode-to-plate voltage of your amp. This DC voltage is measured from pin **8** to pin **3** at the tube socket. The reason it is measured at the socket is because the potential between the cathode (pin 8) and the plate (pin 3) is what's important, not between ground and plate. In a fixed bias amp, where pin 8 is grounded, they will be the same. The difference will be noticed with the cathode bias topology, where a resistor is inserted between pin 8 and ground to develop the bias. We recommend that a qualified technician make this measurement.

2. Now that you have the plate voltage for your amp, select the tube type you are using from the **CHART** below. Find the max plate dissipation (MPD) number across from it, and plug that into the **LOW Formula** on the next page and do the calculations. This will give you the low bias point.

(It will bias the tubes on the low side of Class AB₁ and is a good starting point for a new set of tubes. As they age this current draw may go up or down, depending on the tube brand and other factors. The answer to the formula will be in milliamperes DC and will correspond directly to the readout you get on the BIAS KING™.)

3. Next, to find the high bias point, plug both the screen number and the MPD number for your tube type into the **HIGH Formula** on the next page and do the calculations. This will give you the high bias point.

WARNING, the high bias point should never be exceeded!

4. Now that you have found the low and high bias points, anywhere in this range, that sounds good to you, will be fine.

5. Once you find the bias setting that is most pleasing to you, write the number down and stick it on the amp using the sticker provided. The next time the tubes are replaced in this amp, set the bias back to the Cathode Current number on the sticker and your amp will sound the same.

6. Lower BIAS KING™ numbers (cooler) make your amp sound bigger and cleaner. But too low (into cutoff) and the amp will sound grainy and lack sustain. This is called notch or crossover distortion. Higher BIAS KING™ numbers (hotter) will increase sustain and compression. But too high, and the tube will be driven into saturation and can shorten usable tube life.

MAX Plate Dissipation (MPD) Chart:

(Most brands of tubes should be close to these values; consult your tube manufacturer for exact specs.)

<u>Tube Type</u>	<u>MPD</u>		<u>Screen</u>		<u>Total</u>
6V6GT	13.0 Watts	+	2 Watts	=	15.0 Watts
6L6GC,WGB/5881	20.5 Watts	+	3 Watts	=	23.5 Watts
SV6L6GC	30.0 Watts	+	5 Watts	=	35.0 Watts
EL34 / 6CA7	25.0 Watts	+	8 Watts	=	33.0 Watts
SV6550C	35.0 Watts	+	6 Watts	=	41.0 Watts

LOW and HIGH Range Formulas for Class AB₁

LOW Formula for Class AB₁:
 $(MPD \times 500) \div \text{Plate Voltage} = \text{BIAS KING}^{\text{TM}}$ meter reading

HIGH Formula for Class AB₁:
 $(MPD + \text{Screen}) \times 636 \div \text{Plate Voltage} = \text{BIAS KING}^{\text{TM}}$ meter reading

Example:

Using a 6V650C in an amplifier with 460V between pin 8 and pin 3:

$(35 \text{ Watts} \times 500) \div 460\text{V} = 38 \text{ mA (low point)}$

$(35 \text{ Watts} + 6 \text{ watts}) \times 636 \div 460\text{V} = 58 \text{ mA (high point)}$

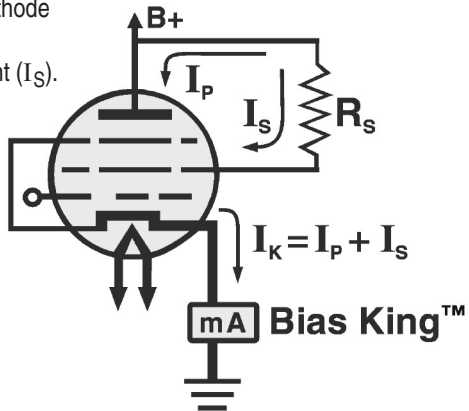
So now you know the correct bias range for this amp—
using this tube—is between a low of 38 and a high of 58mA.
Anywhere in this range, that sounds good to you, will be fine.

Formula for Class A only

$(MPD + \text{Screen}) \times 1000 \div \text{Plate Voltage} = \text{BIAS KING}^{\text{TM}}$ meter reading

For technicians only:

- The BIAS KINGTM measures cathode current (I_K). This is the sum of plate current (I_P) + screen current (I_S).
- After adjusting the bias, the plate voltage (B+) may change, due to the lack of regulation in the amp's power supply. Measure the B+ again, and recalculate the MPD, if needed, until the BIAS KINGTM readings stabilize.



E-mail "BIAS KING"
Steve Wilson at
skwilson@biasking.com
with comments
or questions about
your BIAS KING™



Visit us on the web at:

www.biasking.com

90 Day Warranty

Warranty covers parts and labor (excluding shipping). Warranty begins from date of purchase. Warranty does not cover: pin breakage, guide pin breakage, or wire breakage. Warranty does not cover damage due to misuse of BIAS KING™ models as indicated in the instructions.

To keep informed of updates or changes, fill out the enclosed WARRANTY CARD and send it in with a copy of your receipt.

Within the 90-day warranty period, if you have any trouble with your BIAS KING™ product, we will either repair or replace it free of charge (as long as it hasn't been abused). After the 90-day warranty period, we will still repair or replace the unit for a flat fee of \$45. In either case, just ship the BIAS KING™ with a description of the problem (and the \$45 fee, if applicable) postage prepaid to:



Ambient Sound
306 Appomattox Rd.
Louisville, KY 40214

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