

BLACK BOX
ANALOG DESIGN

HG-2

MIX BUS, MEET YOUR NEW BEST FRIEND

Looking for the piece of gear that gives you that elusive “magic” on your mix bus? We were too! We went through everything from high end summing mixers to racks of insanely expensive gear and most of it barely did anything (you had to sit on the edge of your seat and strain to see if you could tell the difference)! Even when we did find combinations that got us close to what we were after, it meant tens of thousands of dollars in gear and using each piece for very little (sometimes using a piece of gear only for it’s transformers). Most frustrating of all, it meant lots of controls with none of them directly focused on doing what we were after. This was 2009 and it became obvious that no one made what we were looking for so we created *Black Box Analog Design* and spent the next five years designing the HG-2.

The HG-2 is specifically and uniquely designed to be an all in one unit capable of giving you all the vibe, harmonics, saturation, tonal enhancement and RMS you could want on the mix bus. With simple, intuitive controls, no compromise components and unique features not seen on any other piece of gear, the HG-2 replaces many pieces of gear and simplifies mixing.

From extremely subtle harmonic enhancement of the tubes and custom transformers to RMS pushing saturation, full on distortion and natural tube compression, the HG-2 is designed to give you full control over the “mojo” on your mix bus. It also happens to sound awesome on instruments and as a front end for synths and other stereo sources!

Robert & Eric




IMPORTANT SAFETY INFORMATION

READ ALL INSTRUCTIONS BEFORE USE

WARNING!

For your safety, the information in this manual must be followed to minimize the risk of electric shock. Failure to do so may result in property damage, injury or loss of life.

IMPORTANT SAFETY INSTRUCTIONS

 **WARNING:** This device contains high voltage electricity capable of delivering lethal shocks if used improperly.

- **Never, under any circumstances operate this unit without being connected to a properly grounded circuit! If you are unsure, consult an electrician to make sure your outlet is properly grounded before plugging the unit in.**
- **Never defeat ground using a ground lift or other device.**
- **Never expose unit to moisture or water**
- **Do not attempt to service unit or open the case for any reason. Internal capacitors are capable of delivering dangerous shocks even after the unit has been unplugged.**
- **Do not plug in or operate unit if it is visibly damaged.**
- **Never replace fuse with a fuse of a different rating.**

CONTROLS

WHAT DOES THIS BUTTON DO?



- 1 3 way power switch with Off/Standby/On positions: Standby mode sends power to the tube heaters and LEDs
- 2 Sat. Freq. chooses which frequencies are present in the parallel sat. circuit
- 3 Brings the parallel saturation circuit in or out
- 4 Saturation pot adjusts how much of the parallel saturation signal is fed into the main signal path
- 5 Switches between two sets of 12AT7 tubes in the parallel saturation circuit
- 6 Pentode gain control
- 7 Meter mode button selects between 3 meter modes
- 8 Triode gain control
- 9 Engages or disengages high frequency "air" lift
- 10 Left / Right ultra fine trim adjust (.4 db total)
- 11 True bypass switch shorts input XLRs directly to output XLRs
- 12 Passive output attenuation



- 13 IEC power socket
- 14 2AG power fuse: Replace only with the same rating fuse (4 amp slow blow)
- 15 Master on/off switch: In the "off" position, no power will reach the face plate and the front panel power switch will be inoperable. Be aware that in the "on" position, power is present inside the box even when the power switch on the front panel is in the "off" position.
- 16 Balanced line input
- 17 Balanced line output

CONTROLS

THE METER

The first thing you may notice about the HG-2 meter is that there is no scale. The first reason there is no scale is that the meter has the ability to switch between 3 different gain settings to suit different gain staging preferences and work flows. The second reason we decided not to add a scale is that we want to encourage you to use your ears! The meter is there simply to give you visual feedback about the energy of your mix.

Modes

Briefly pressing the meter button allows you to switch through 3 display modes.

VU: In this default mode, the meter shows a standard VU style response

VU/Peak: In this second mode, a peak function is shown along with the VU

Center: The third mode displays the energy of the mix centered on the meter and moving in both directions.

Speed

Pressing and holding the meter button for **3 seconds** allows the user to adjust the **response speed** of the meter. The speed setting will be shown on the **top right** of the meter with the speed setting indicated by the number of LEDs lit. Quickly pressing the button again while in this mode will move through the settings.

Gain setting

Pressing and holding the meter button for **5 seconds** allows the user to adjust the **gain** of the meter. The gain setting will be shown on the **top left** of the meter with the speed setting indicated by the number of LEDs lit. Quickly pressing the button again while in this mode will move through the settings.

The middle (default) gain setting will be appropriate for the vast majority of scenarios.

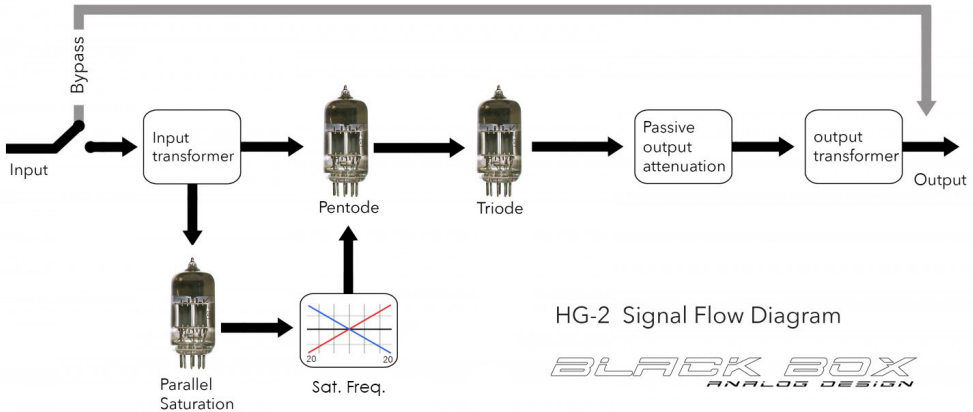
INTRODUCTION

WHAT CAN THE HG-2 DO?

Add Harmonics and Saturation (in multiple ways)

The main signal path of the HG-2 travels from the input transformers to the Pentode amplification stage, on to the Triode amplification stage and finally to a passive output attenuation before hitting a pair of custom output transformers. The tubes naturally produce pleasing harmonics but each stage (Pentode and Triode) are voiced to produce more and more harmonics and eventually saturation as you drive them harder. **Driving the Pentode quickly produces harmonics while pushing the Triode saturates the signal in a very pleasing way.**

Along with the main signal path, the HG-2 also has a parallel path that splits off directly from the input transformers. This parallel path is fed into a pair of 12AT7 tubes, voiced for their own pleasing harmonics. The “saturation” knob allows you to mix in as much of this parallel signal as you want with the “dry” signal before being recombined at the Pentode stage. These three knobs (Saturation, Pentode and Triode) give you full control over how much and what type of saturation and harmonics you add.



INTRODUCTION

Increase RMS of your signal

The same controls that allow you to enhance your signal with harmonics, also allow you to increase the RMS of your signal by pushing the tubes into saturation and natural compression. Each tube stage is specifically setup to have a range that goes from clean reproduction of the signal to full saturation where the peaks are compressed and the average level is increased. Since each stage feeds the next (parallel saturation feeds Pentode which in turn feeds the Triode), **the stages interact in a very useful way.** In other words, if you set the Pentode and Triode to just before where they begin to saturate, adding signal from the parallel saturation circuit or driving the Pentode harder will push the Triode into saturation. You can then push the Triode itself harder which will in turn produce more compression, increasing your perceived level while maintaining your peaks. Similarly, pushing the parallel saturation circuit hard will allow you to achieve compression at the Pentode stage which can then be used to push the Triode as hard as you like from clean to further compression.

Shape Tone

In addition to being another source of harmonics and saturation, the parallel saturation circuit also opens up tonal possibilities. The 3 way "Freq. Select" switch gives the user the option to choose what frequencies are present in the parallel saturation circuit. The "low" position feeds the circuit only lows and low mids, the "high" position feeds the circuit only the highs and high mids and the "flat" position feeds full bandwidth. This allows the user to add body and weight to the low end of tracks by mixing in the saturated signal and harmonics only in the low end or add sizzle, bite and harmonics only to the top end of dull tracks. The "air" switch is a gentle lift starting at 10kHz.

Instantly Switch between Tubes

The "alt tube" button instantly switches between two sets of parallel saturation tubes. The "alt" tube is voiced slightly more aggressively allowing for even more flexibility.

GETTING STARTED

WHAT SETTING SHOULD I START WITH?

When setting up the HG-2, start with a neutral setting that closely matches the original signal. To match, use the bypass to switch back and forth as you make adjustments.

Pentode: 12 o'clock	NEUTRAL SETTING*
Triode: 10-11 o'clock	
Output: Adjust until levels match when bypassed	
Parallel sat circuit: Off	
Air: Off	

** It's important to remember that the HG-2 is designed to saturate, so how hard you drive into it affects the response. Aim for the signal roughly halfway up the meter as a starting point. If your track is extremely hot or low in volume, adjust the signal feeding the INPUT of the HG-2.*

Adjusting the Pentode and Triode

From the neutral setting, begin by increasing the Pentode gain. This will increase the Pentode harmonics and eventually begin gentle saturation. As you turn the Pentode up, turn the Triode down to compensate. Now go back to the neutral setting and turn the Pentode up again but this time, use the output attenuation to compensate. Notice the difference in response.

Starting again from the neutral position, increase the triode gain, using the output volume to compensate for the volume difference. Continue to experiment with driving both the Pentode and Triode in different amounts until you find a setting you like.

Adding the parallel saturation circuit

Once you have a Pentode and Triode setting you like and your output level peak matched, make sure the **"Saturation" knob is all the way down** and the **"Sat. Freq." switch is in the "flat" position**, then engage the parallel saturation circuit via the "in/out" switch. Slowly turn the knob clockwise to mix in more of the saturated signal and keep watching your peak meters. You will notice that how much increase in peak or RMS levels you achieve is dependant on the settings of the Pentode and Triode. **If the Pentode and Triode are in a very "clean" setting, the parallel saturation circuit will add both peak and RMS. If the main path is already in saturation, the parallel saturation circuit will further saturate the signal, resulting in higher RMS without much peak gain.**

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GETTING STARTED

Shaping tone

In addition to the harmonic and saturation control, the HG-2 also allows the user to shape tone via the “tilt” selector and the “air” switch.

The “Sat. Freq.” selector

The 3 position “Sat. Freq.” selector is a simple yet powerful feature that allows the user to choose what are present in the parallel saturation circuit.

In the “Flat” position, full bandwidth is fed into the circuit, allowing for saturation of all frequencies.

In the “Low” position, only the low mid and bass frequencies are fed into the circuit. This allows the user to add body and weight to recordings.

In the “High” position, only high mid and high frequencies are fed into the circuit, allowing the user to add sizzle, presence and top end.

“Air” boost

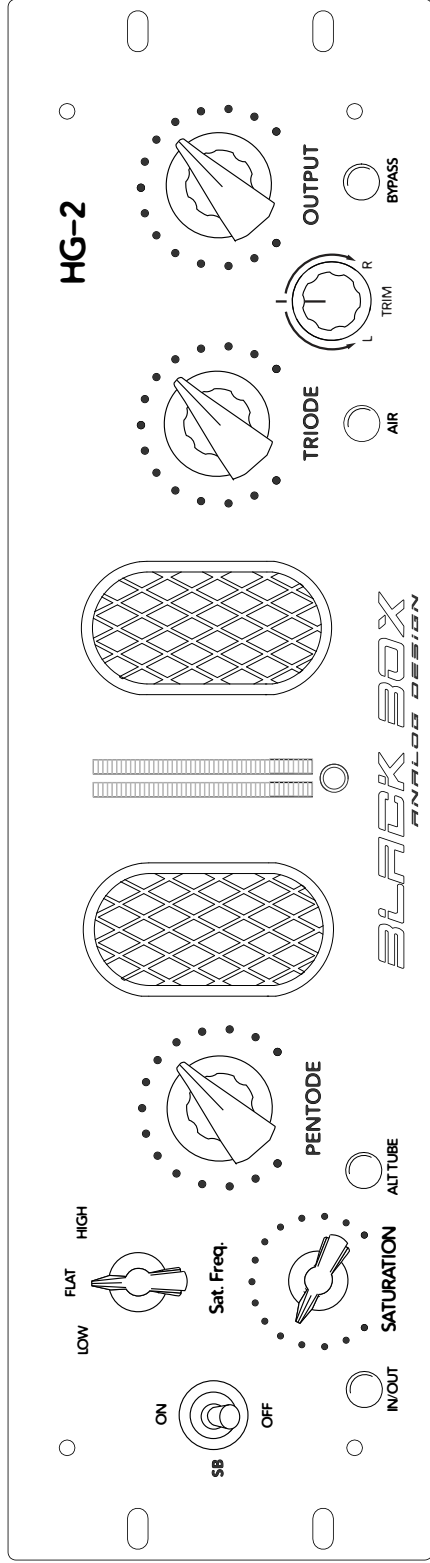
The “air” boost is a gentle high frequency lift that begins around 10kHz and gently increases as it approaches 20kHz. The boost is inserted in the main signal path, at the Triode gain stage.

“Alt tube ”

The “Alt tube” selector switches between two sets of 12AT7 tubes in the parallel saturation circuit. The “alt” tube is voiced slightly more aggressively, giving the user a wider range of tones and saturation types.

SESSION: _____ DATE: _____

TRACK: _____



NOTES:

CALIBRATION

HG-2

CALIBRATION

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WARNING!

The HG-2 contains potentially deadly voltage and calibration should be performed only by a qualified professional

When do I need to calibrate by HG-2?

The HG-2 was designed to last a lifetime but tubes don't. No two tubes are exactly the same and they change slightly over time so it is occasionally necessary to re-calibrate the unit for optimal results. We suggest performing this calibration any time you change tubes or if the unit appears to be drifting from its normal response. This usually appears as a drifting imbalance in the left/right matching.

You will need:

- Phillips screwdriver
- Small jewelers flat head screwdriver or trimmer tool
- Signal generator (inside your DAW is fine)
- A standard set of meters with numerical readout in 10ths of a db (inside your DAW is fine)
- A pair of surgical gloves (optional but recommended to reduce the risk of electric shock)

IMPORTANT: Calibration should be done in the order laid out

CALIBRATION

HG-2

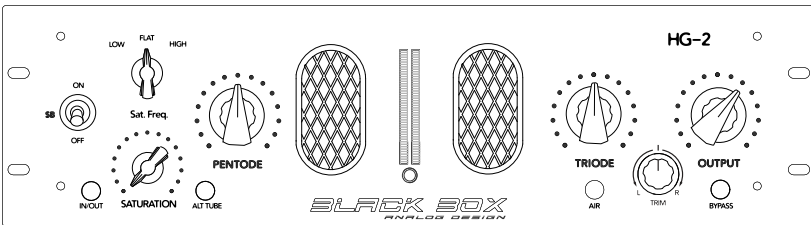
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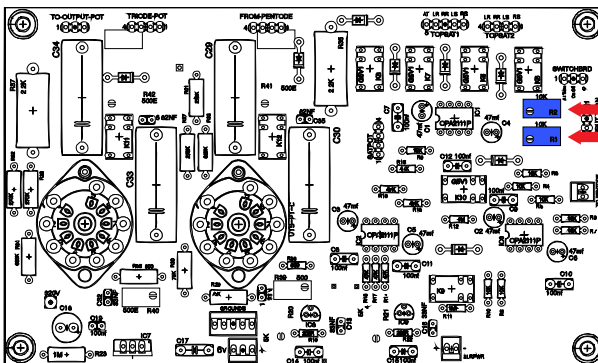
Step 1: Input Calibration

Sets the overall input level of the HG-2 for proper gain staging as well as left / right balance.

- 1: Set the HG-2 so that the Pentode and Triode are at 12 o'clock, output is set as shown below. Make sure 'air' and Saturation are off.



- 2: Send the output of the signal generator (or DAW) into the HG-2 and feed the output of the HG-2 to the meters.
- 3: Send a 1khz, -20 signal to the HG-2. The exact level is not important as long as it is not driving the unit into saturation.
- 4: Put the HG-2 into bypass and note the reading on your meters (not on the HG-2)
- 5: Disengage bypass and note the meter reading. Adjust the input trimmers (see below) as needed until the reading matches the reading in bypass mode. When the meter reading is the same in bypass and active states, the HG-2 is input gain is calibrated properly.



REAR

CALIBRATION

HG-2

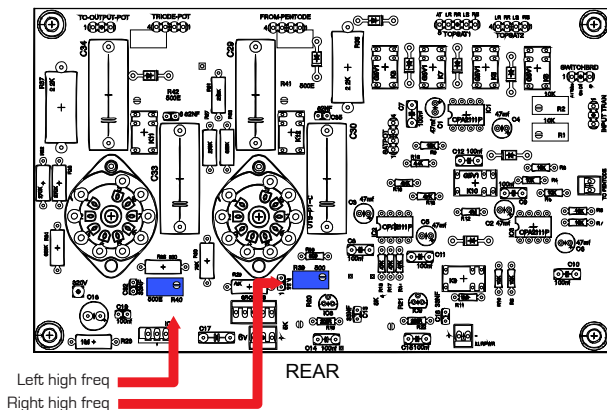
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Step 2: High frequency response

This sets the overall brightness of the HG-2. Because the HG-2 creates a great deal of harmonics, it naturally enhances the top end and feels brighter in a flat setting. For that reason, the HG-2 is shipped with the top end slightly attenuated to compensate. These adjustments allow the top end to be matched between the left and right and also allow for the unit to be made brighter or darker.

- 1: With the HG-2 still at the unity settings described earlier, feed it a 1khz tone at -20db and note the reading on the meter.
- 2: Adjust the signal generator to send 12khz at -20db and note the reading. We suggest calibrating the unit so that the reading is between -8 and 1.5db lower at 12khz compared to 1khz but the exact amount of attenuation is up to the user.
- 3: Adjust the trimmers (see below) until they reach the desired amount of attenuation and both sides match. Bypass the unit as needed to check the amount of attenuation.



CALIBRATION

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CALIBRATION

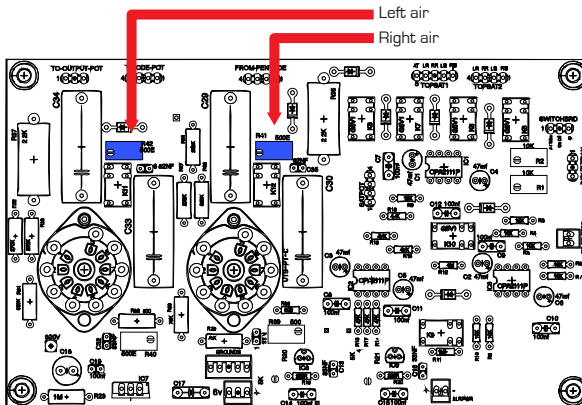
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Step 3: 'Air' boost

This calibration allows you to set the amount of air added when the air circuit is engaged. It also allows you to match the left and right side air boosts.

One thing to note is that the gain adjustment also changes the corner frequency slightly. Lowering the amount of air boost also lowers the frequency slightly and increases the resonance at that frequency. This means that as you increase the air boost, you get more top end extension but slightly less resonance boost and the frequency of that boost goes up. For this reason, lowering the gain can also make the boost slightly more noticeable and adding more gain will actually create a more linear response overall, even though it is adding more top end extension to the boost.

- 1: With the HG-2 still at the unity settings described earlier, feed it a 12khz tone at -20db and note the reading on the meter.
- 2: Engage the air circuit and note the meter reading.
- 3: If the sides are not matched when air is engaged or you would like to adjust the amount of boost, adjust the trimmers below.



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Step 4: Parallel saturation

This calibration allows you to adjust the left / right balance of the saturation circuits as well as adjust how hard the signal hits the stage.

- 1: With the HG-2 still at the unity setting, feed it 1khz at -20 and note the meter reading.
- 2: Set the Parallel saturation knob to 12 o'clock and make sure the "alt tube" button is disengaged.
- 3: Engage the saturation circuit and note the meter reading.
- 4: As needed, adjust the trimmers below until the two sides match.
- 5: When the main circuit is matched, engage the "alt tube" button and repeat the adjustments with the appropriate trimmers.

