

Brownout 1000 Owner's Manual

PLEASE READ THIS ENTIRE MANUAL BEFORE OPERATING

Congratulations on having in your possession the most powerful tube bass amplifier on the planet! Being a bass player myself, I have always been on a quest for more power and I love tube tone so it was only natural for me to want an amp that does not exist. Being familiar with tube amps, designing and building them, I was up to the challenge. This amplifier represents everything I have learned from servicing, modifying, and building tube amplifiers small and large over the past 10 years. It is my baby and I am very proud of the monster that I have created.

The idea behind this amplifier was to have high power tube tone to drive multiple speaker cabinets but at the same time have a versatile preamp with a variety of tones available. So I came up with the idea of a stereo power amplifier and a stereo preamplifier with the ability to switch channels or assign either preamp channel to either power amp channel and also have a line out that can run from either preamp channel. I also wanted the ability to use the amplifier as a high power, hi-fi stereo amplifier. And to look downright sexy at the same time! All of these features are built into the brownout 1000.

Table of Contents

1. Input and Output Connections
2. The Power Supply
3. Front Panel Controls
4. Rear Panel Controls
5. Preamp Settings
6. Output Tube Biasing and Symmetry Adjustment
7. Troubleshooting
8. Specifications

Input and Output Connections

The brownout 1000 comes with several cables. They include an AC power cable(1), power supply to amplifier power cable(1), foot switch controller cable(1), line in to 1/8" headphone cable(1), and speaker cables(2).

When using the amplifier, the power supply to amplifier cable should be installed then the speaker output cables, the foot switch controller cable, then the AC power cable. If only one amplifier output is to be used it is very important that the unused power amplifier is on standby. Otherwise, damage may occur to the output transformers or amplifier if a large signal is passed with no speaker load on the output. All cables should be removed when transporting the amplifier.

The included power cable is a heavy duty 12 gauge unit with a neutrik powercon connector(NAC3FCA). It is rated at 20 amps which is higher than a standard IEC connector is rated which is why I went with it. If the power cable is missing, a new one can be constructed but make sure to use a 12 gauge or larger cable.

The power supply to amplifier cable uses 2 TE connectivity connectors(p/n 207485-1) with strain reliefs(p/n 207774-3), crimp pins(p/n 66592-1), and high power pins(p/n 66261-4). A new cable can be constructed with these parts if it is lost or missing. Just make sure it is long enough to reach power supply to amplifier. The pin connections are one to one from one connector to the other and 18 gauge wire should be used for all wires except for the 4 high power pins which should be 12 gauge. Teflon insulated, silver plated wire rated at 600V is the preferred wire type for this cable.

The foot switch cable has an 8 pin DIN connector on the pedal side, and a 7 pin radio connector on the amplifier side. Should this cable become missing, a new one may be constructed.

The speaker cables are standard speak-on cables but should be 12 gauge or larger.

The Power Supply

The power supply of the brownout 1000 is the heart of the beast. Without a robust power supply, the power output and low frequency response of this amplifier would not be possible. That being the case, it is capable of delivering a massive amount of power and voltages high enough to kill a person instantly if handled the wrong way. So please, if you do not know what you are doing, do not attempt to service the power supply. Even when unplugged from the wall it can still have lethal voltages stored in the filter capacitors.

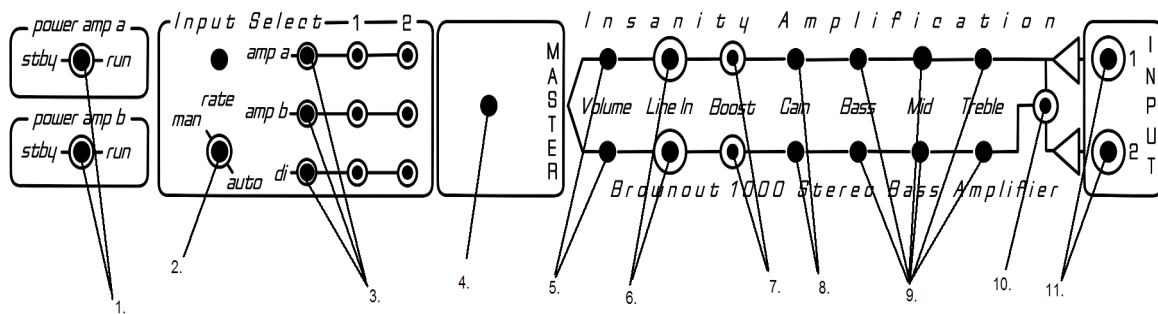
The operation of the power supply is fairly straightforward. To turn the amplifier on and start warming the tube filaments, simply turn the power switch on. It is recommended to have the power supply on standby for a couple minutes while the tubes warm up before turning off standby. Once you are ready to play through the amplifier, switch standby to the up position and now the high voltage supplies should ramp up through the soft start circuit. After about 5 seconds a click should be heard and full voltage is now available to the amplifier. The 'easiest' turn on for the power supply is with both power amplifiers on standby when turning the power supply off standby. It can still easily handle both amps being on but causes the power supply to draw more input power when releasing the soft start circuit which will make the amp more prone to blowing circuit breakers if there are other appliances plugged into the same AC circuit as the brownout 1000.

On the front panel you will notice two analog meters. One is for monitoring 3 different high voltage supplies which are selectable with the rotary switch next to it. The other is a meter that monitors how much current the output tubes' plates are drawing. It is normal for the high voltage supplies to drop slightly under load and the current meter will jump around too depending on how much power is being output.

The two knobs on the front panel are for adjusting the preamp voltage and the output tube screen grid voltage. I put them on the front panel to be able to adjust these two different voltages to see how the amplifier reacted with varying operating conditions for testing purposes. If I built subsequent amplifiers these would be fixed and not user adjustable. I would not recommend changing these voltages from what they are set at. Changing the output tube screen grid voltage will change the bias point of the tubes and require them to be rebiased. The standard settings for these are 400V for the preamp voltage, and 350V for the screen grid voltage.

There are fuses on the rear panel for the various supplies in the amplifier and also one fuse on the top of the chassis for the preamp filament power supply.

Front Panel Controls



1. Standby – These two switches are used to turn on and off each individual power amplifier. If an output amplifier is not to be used, the switch should be in the standby position. They should both be on standby for initial power up.

2. Autoswitch Control – This switch and knob are used to turn on the autoswitch and adjust its rate.

3. Channel Select – These momentary switches select which preamp channel goes to which power amplifier and to the d.i.(line out).

4. Master Volume – This knob controls the volume of both power amplifiers.

5. Individual Volume – These control the volume of individual preamp channels.

6. Line in – These are line level, post tone and gain control mono inputs.

7. Boost – Preamp gain boost for small signals or overdrive.

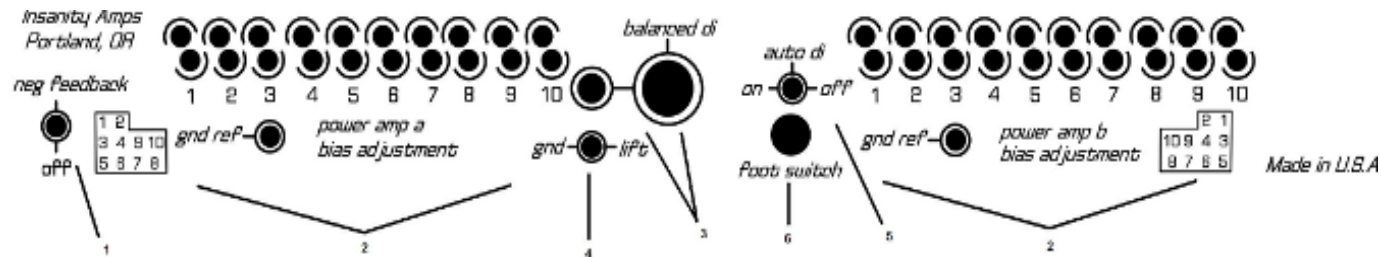
8. Gain – Adjusts the gain of a given preamp channel.

9. Tone Controls – Used to adjust the tone of the input signal

10. Channel Bridge Switch – Used to drive channel 2 preamp with channel 1 input

11. Input – Instrument level inputs.

Rear Panel Controls



1. Negative Feedback – This connects global negative feedback from the output to the phase splitter input. Off will yield more volume, on will yield a more accurate signal. This should normally be on.
2. Bias Control – These test points, multiturn potentiometers, and ground testpoints are used to bias the output tubes.
3. Line out – There are both 1/4" mono and xlr line outs. The line out is tube powered, transformer coupled with a 600 ohm output impedance. Only one or the other should be used, not both at the same time.
4. Ground Lift – Used to connect or disconnect ground if there is hum in the line out.
5. D.I. Auto select – This will turn on and off channel switching for the line out. In the off position, the D.I. select is only available via the front panel momentary switch.
6. Foot switch – This is where the foot controller plugs into the amplifier.

Preamp Operation

The preamplifier in the Brownout 1000 was designed with the bass player in mind. As such, the tone controls are geared that way. But they are not the same. Channel 1 employs a baxandall tone stack, similar to what the Ampeg SVT has. Channel 2 uses a Fender/Marshall style tone stack and is similar to the standard Fender Bassman tone stack. Since the two tone stacks have different losses, the same signal on both channels will require more gain on Channel 1 to have the same volume level. Everything else about the preamps is the same. Both channels may be driven with the Channel 1 input by setting the channel bridge switch to the left. In the right position, the preamp channels are separate which allows running a different instrument into each channel.

The flow of controls from right to left represents the actual preamp gain structure. Each input goes through one tube gain stage then through the tone stack to the gain control, into the next tube gain stage. The channel bridge switch changes the signal that goes to the Channel 2 tone stack from Channel 2 to Channel 1 so that Channel 1 is driving both preamp channels. The boost switch increases the gain of post tone control gain stage. From there is the line input. When a jack is inserted into the line in, the signal from the previous gain stage is disconnected so that the gain and tone controls will be disabled for that channel. The line in goes directly to another tube gain stage then into the volume control. It is then buffered and sent to the master volume control, on into the phase splitter and then the power amplifier. When using the line in, you should set the volume control for that channel fully clockwise and then use the master for volume control.

The volume control on each channel should be used to set the volumes of the preamp channels in relation to each other then use the master for overall volume control. If you want to have some overdrive on the preamp signal, crank the gain then use the volume to tame the level. It is possible to clip the master volume buffer by applying too much preamp volume but that is dependent on how hot the instrument pickups are, and preamp gain level. Clipping the buffer will not hurt it but the sound may be undesirable so if you experience unwanted clipping while turning up the volume knob, back off of it and use the master for volume control. It should not clip when using the line in with a line level and volume all the way up. This was a design compromise to be able to use both line level and instrument inputs but should not cause any problems so long as you know how the circuit works.

Channel switching is accomplished via momentary switches on the front panel or with the foot controller. When the Brownout 1000 is first powered up, the channel positions are set to the default of Channel 1 being routed to both power amplifiers and the D.I. To change that, simply press the button for which amplifier you want to channel switch and the preamp will toggle which preamp channel is sent to that amplifier. Pressing the left most switch on the foot controller will switch all 3 simultaneously unless the D.I. auto select on the back panel is switched off. If you were to use the amplifier as a stereo amplifier using the line inputs, you would want to set power amp b to preamp channel 2. Or power amp channel a to preamp channel

2. Then if you hit the foot switch, left and right channels will swap sides! This feature also allows you to be running an instrument into one input and then bounce the signal back and forth between power amplifiers and subsequent speakers. Further use of the Autoswitch control will bounce it back and forth automatically with the rate controlled by the rate knob. The Autoswitch control is available on the front panel and also the second switch from the left on the foot controller. Setting the foot controller switch will disable the front panel switch. Another effect you can get using the Autoswitch control is if you run one preamp channel, set both power amps to the same preamp channel then turn on the Autoswitch. This will turn on and off your signal into both channels. A further effect would be to drive both preamp channels from the Channel 1 input then set one channel's volume lower than the other for a tremolo effect with the amount of effect set by the two channels' volume controls and the rate set by the rate knob. A stereo tremolo effect can then be had by switching one of the power amp inputs.

The master volume control is motorized and the footswitch controller has two switches to turn up or down the master volume. They are the two on the right side of the controller.

Output Tube Biasing and Symmetry Adjustment

The output amplifiers in the Brownout 1000 use a total of 20 KT88s. They should only be replaced with KT88s or another octal tube with higher ratings. A 6550 will not hold up to the higher plate and screen grid voltages available to the output tubes. To properly bias the amplifier, let the amp warm up on standby for a few minutes then turn standby off. The bias value will change whether you have one or both power amplifiers turned on at the same time. The Brownout 1000 should be biased with only one power amplifier on at a time. To bias, put the ground lead of a voltmeter into the ground reference under the bias controls of the amplifier you are biasing. It is important that you keep the meter ground into the reference of each amplifier being biased, as the two ground references are not the same. They are specific to each amplifier. Once the ground connection is made, use the positive meter lead to check the test point of each individual tube and adjust the potentiometer for that tube until approximately 45-50mV is achieved. Once all are adjusted, go back and check them all again and readjust if necessary. Once one power amplifier is biased, turn it on standby then turn on the other power amplifier and bias it in the same manner.

If the screen grid voltage is changed then the amplifier must be rebiased. There is no good reason to change the screen grid voltage unless a different operating point is desired for whatever reason. Turning the screen grid voltage up will cause the tubes to draw more current so they will have to be biased lower. I would recommend turning the bias down 10-20mV then turning the power amplifiers on standby before raising the screen grid voltage on the power supply.

The output symmetry controls are hidden on the top side of the amplifier chassis on the left, behind the top front panel grill. These should normally not need to be adjusted unless you replace the phase splitter tubes with some that are not well matched. Even then, it will probably be close enough to not have to worry about ever adjusting them. What the output symmetry controls do are to slightly change the gain of each phase splitter to get evenly matched signals to the power amplifiers. If one output is greater than the other then the push-pull output stage in the power amplifier will be unbalanced, causing you to not be able to get the maximum available clean power output before one side of the push-pull stage starts clipping. This is only of concern when one or both of the power amps are being pushed to the edge of clipping. The best way to adjust the output symmetry is to have the amplifier chassis out and on its side, powered up with both power amplifiers on standby. Put a 300mV RMS, 1kHz sine wave into one preamp channel's line in with the volume on that channel up all the way and the master volume all the way down. While observing the AC voltage on one of the 3 pin connectors connecting the preamp to the power amps(J15), slowly turn up the master volume until you read 10VRMS. Now check the other pin in the connector. The third pin is ground. These voltages should be close to each other. Use the symmetry control to even them. Repeat the procedure with the other preamp channel.

Brownout 1000 troubleshooting

Please refer to the schematics, layouts, and other information provided in the USB port attached to the power supply cabinet.

The brownout 1000 was designed with massive power output in mind and also fairly easy disassembly for servicing. The output transformers and output speaker panel should never need to be removed from the cabinet unless the unlikely event of one of the output transformers going bad. The amplifier is removed from the cabinet by first removing the lower front panel grill then removing the two allen head machine screws that are holding the front of the amplifier to its mounting rails. The amp should slide out the back giving access to the output connector on the top of the amplifier. Once the amp is out of the cabinet it can be positioned on its side on an elevated surface with the power and output cables installed to allow access to the inside circuitry while it is powered up.

If one of the power amplifier boards needs to be removed for any reason, the preamp board must first be removed. To remove the preamp board you must remove all the preamp tubes, unplug the connectors noting which one goes where(they are all apparent but the 3 pin connectors could possibly get mixed up), remove the screws, then remove the master volume knob and the nut on the potentiometer. Next, move the master volume board up and out of the way to be able to angle the preamp board up and out of the chassis. Take care with the connectors plugged into the front of the board to avoid kinking the wires. It is tight but it will go in and out and I have done it at least 20 times while fine tuning the circuit!

1. A certain output tube will not bias

The first thing to do in this case is to remove the suspect tube and put another in its place. If it still will not bias then the fuse for that tube should be checked. If it is blown then the source needs to be found. Testing of the output tube will show if it is bad. If the tube tests good then the bias voltage should be checked. It should be somewhere around -40V. If it cannot be adjusted to that level then there is most likely something wrong with the MOSFET driver for that tube which will have to be checked. If none of the tubes will bias, check the fuses and also the bias supply.

2. A set of 4 output tubes' filaments will not power up

Since the tubes are wired in 5 sets of 4 in series, if the filament from one output tube opens, it will cause four of them to not light up.

3. There is no sound in either output

There are many reasons this could be but the first thing to check of course are the input and

output connections and the standby settings. Also make sure the channel select lights are lit. Next, take a look at the voltage and current meters on the power supplies. If the amp is off standby, it should be drawing about .2A with one power amp on, and about .4 with both power amps on. The plate supply should read around 680V, and the preamp and screen grid voltages should read between 300V and 400V, depending on how they are adjusted. If any of these readings do not agree with what is observed then it is time to start troubleshooting.

If you have all the voltages but no current is being drawn, check to make sure the filaments on the output tubes are lit. Also check the individual standby switches. If one or more voltages read 0 then there is something wrong with the power supply. Check the fuses on the back then continue. If the preamp or screen grid voltage reads high (and current meter reads high), around 500V or more and cannot be adjusted then one or both of the high voltage regulators are blown and need to be repaired. The power supply can safely be ran without the amplifier connected to it but make sure the power cable that attaches the two is disconnected on both ends. There is a relay that turns the high voltage (plate and screen grid) on that is powered by the -130VDC bias supply. If this supply is dead then no high voltage will be allowed out of the power supply chassis except for the preamp supply.

To remove the power supply from its cabinet, first remove the front panel grill. Then remove the 4 bolts that hold the plate transformer to the chassis and disconnect the power connectors at the rear of the transformer. Carefully remove the plate transformer from the front of the cabinet. You can get your hands underneath the bobbin on both sides of it and lift it up and out. Then remove the bolts on the bottom of the cabinet that hold the chassis into the cabinet. Most of the power supply can be checked out without the plate transformer installed so it would be advised to leave it disconnected while troubleshooting unless the problem is with the plate supply.

4. One side works but the other side does not

To determine if this is a preamp issue or a power amp issue, use the channel switch. If a signal can successfully be routed to the other power amplifier and have sound come out that side then that says one preamp channel is bad. If neither preamp channel can make one power amp turn on then that says there is a problem with one power amp.

5. There is popping or noise in the output

This is almost always caused by a bad preamp tube. Try swapping tubes in and out until the bad tube is found.

6. It keeps blowing fuses

To determine if the problem is in the power supply or with the amplifier, disconnect the power cable between the two and turn on the power supply and also take it off standby. If it still blows fuses then the problem is in the supply. If it does not blow a fuse then turn the power supply off, connect the power cable back up to the power supply but not the amplifier. From chassis ground, check the voltage on pins X and XX of the cable. They should read -130VDC and +30VDC. If the -130V is not there then the supply is likely dead or current limiting for some reason. If it only blows fuses when the amplifier is powered up then check the bias voltage on pin 5 of all the output tubes with the amp on standby. If any or all of them are not somewhere around -40V then there is something wrong with the bias circuit or the -130V power supply is dead. Or possibly some blown MOSFET drivers.

7. The Channel Select Lights are not lit and I have no output

If the pink LEDs are not lit then there is something wrong with the preamp control module or the power supply feeding it. They should come on when the power supply main power switch is turned on. The preamp control module is located in the power amplifier chassis, mounted to the side. If the preamp control module is not working then there will be no preamp operation possible since it controls the LDR channel switches and they will all be off. Likewise, if all of the LEDs are lit up then there is probably something wrong with the preamp control module.

Here are the pin connections of the various interconnects:

Power Supply to Amplifier Cable:

1. Plate Supply (700VDC)
2. Chassis Ground
3. Screen Grid Ground
4. Preamp Supply (400VDC)
5. Screen Grid Supply (350VDC)
6. Preamp Ground
7. Output Tube Heater Supply+ (50VAC)
8. Digital Controller Supply (12VDC)
9. Preamp Filament, Digital Controller Ground
10. Output Tube Heater Supply- (50VAC)
11. Cooling Fan Ground
12. MOSFET + supply (30VDC)
13. Bias Supply (-130VDC)

14. Cooling Fan Supply (12VDC)
15. Plate Supply Ground
16. Preamp Filament Supply (6.3VDC)

Amplifier to Output Panel Cable

1. Amplifier B +
2. Amplifier B -
3. Plate Supply
4. Plate Supply
5. Amplifier A +
6. Amplifier A -
7. Ground
8. Negative Feedback A
9. Negative Feedback B

Specifications