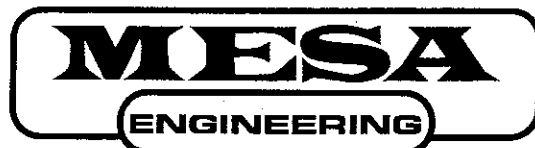


BARON

OWNERS MANUAL



Vacuum Tube Audio

1317 Ross Street Petaluma, CA 94954
USA

GREETINGS FROM MESA ENGINEERING

Thank you for putting your trust in us with your Mesa BARON purchase. You have become a part of the Mesa Family...and we welcome you! Our goal is to never let you down as we work to make this purchase one of your most rewarding musical investments. You are now the owner of an amplifier with a thoroughbred musical lineage -- one which culminates 25 years of vacuum tube heritage by combining elements of the classics with a newly innovative spirit. Feel confident, as we do, that this amplifier will inspire many hours of musical satisfaction and lasting enjoyment. It was built with you in mind by listeners and players who know the value of a fine musical instrument and the commitment it takes to make great music. The same commitment to quality, value and support we make to you...our new friend.



The Spirit of Art in Technology™

© 1996

BARON

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Your Mesa/Boogie Amplifier is a professional instrument. Please treat it with respect and operate it properly.

USE COMMON SENSE AND ALWAYS OBSERVE THESE PRECAUTIONS:

- Do not expose amplifier to moisture, rain or water, direct sunlight or extremely high temperatures.
- Always insure that amplifier is properly grounded.
- Always unplug AC power cord before changing fuse or any tubes.
- When replacing fuse, use only same type and rating.
- Avoid direct contact with heated tubes
- Insure adequate air circulation behind amplifier.
- Keep children away from amplifier.
- Be sure to connect to an AC power supply that meets the power supply specifications listed on the rear of the unit.
- If there is any danger of lightning occurring nearby, remove the power plug from the wall socket in advance.
- To avoid damaging your speakers and other playback equipment, turn off the power of all related equipment before making the connections.
- Do not use excessive force in handling control buttons, switches and controls.
- Remove the power plug from the AC mains socket if the unit is to be stored for an extended period of time.
- Do not use solvents such as benzene or paint thinner to clean the unit. Wipe off the exterior with soft cloth.

YOUR AMPLIFIER IS LOUD! EXPOSURE TO HIGH SOUND VOLUMES MAY CAUSE PERMANENT HEARING DAMAGE!

No user serviceable parts inside. Refer service to qualified personnel. Always unplug AC power before removing bottom panel

EXPORT MODELS: Always insure that unit is wired for proper voltage. Make certain grounding conforms with local standards.

READ AND FOLLOW INSTRUCTIONS OF PROPER USAGE.

BARON

OVERVIEW:

Your new Mesa BARON is an audiophile amplifier with a musical heritage. More than just a playback amp, the BARON is like a musical instrument in its own right, handbuilt with the same commitment and passion that we bestow upon our entire line of *Mesa/Boogie* products.

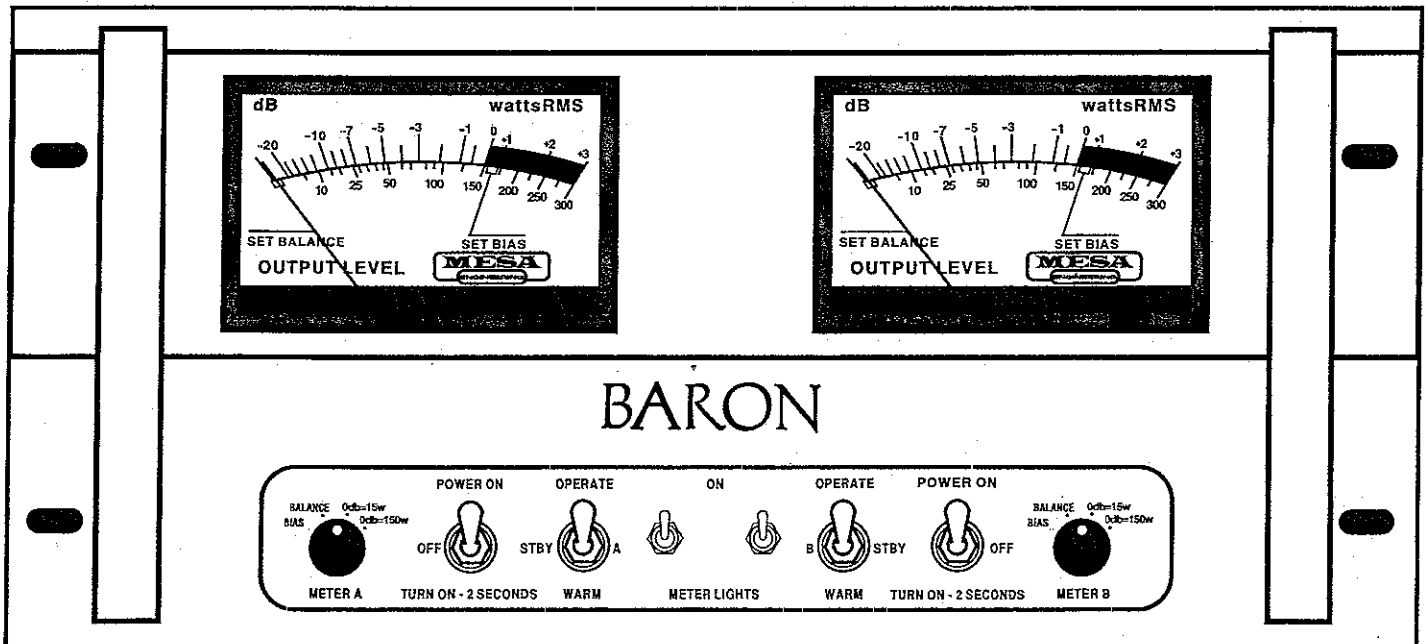
In the realm of live performance, Mesa/Boogie products have earned a stellar reputation for 25 years of innovation, reliability, customer service and for providing the individual soul of a treasured musical instrument. The earliest BARON was a one-off audiophile prototype fully handformed in my one-room shop tucked away in the mountain redwoods of Marin County, California. Although this was a complete unit looking almost identical to today's BARON, I couldn't find a metal fab shop in 1979 that was willing to duplicate its roll-bars, handles and covers.

Thus, while the proto BARON'S sheet metal was destined to become a sleeping beauty, the power of its circuitry was not to be denied. What followed quickly were the M-180 and M-190 monoblocks which accidentally revolutionized the recording and big-arena systems of the world's top guitarists. Thus the professional guitar rack was born (Prior to the M-Squad duo, many artists were forced to consign their tone to powerful but soul-less transistor wattage.)

Serving as the transitional link between mono and stereo was the popular *Strategy 400* which, in between gigs, powered many a playback system and spawned our current line-up of all-tube stereo guitar power. Thus today's BARON has come full circle, resurrecting its original audiophile roots...right down to the classic look. Lessons learned over decades of instrument design have contributed to this product's reliability, while patience has allowed the BARON time to fully evolve along its own path...leading finally to *Tandem-State Imaging*. By providing incremental combinations of Triode and Pentode power with fully switchable negative feedback, *the BARON offers listener-tunable soundstage imagery*, a patent-pending first.

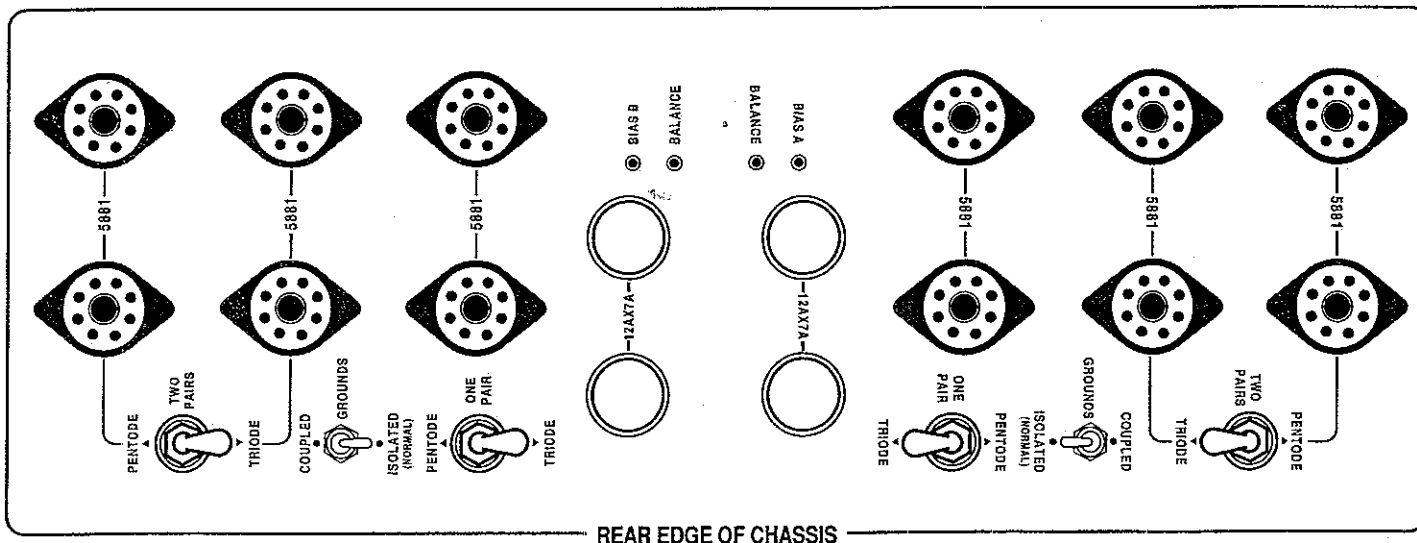
Our passion is devoted to making each amplifier worthy of the respect due a fine musical instrument. And with our combined resources and experience, we genuinely seek to make your Mesa BARON one of the most rewarding purchases of your life. *Enjoy your music!*

FRONTVIEW: BARON

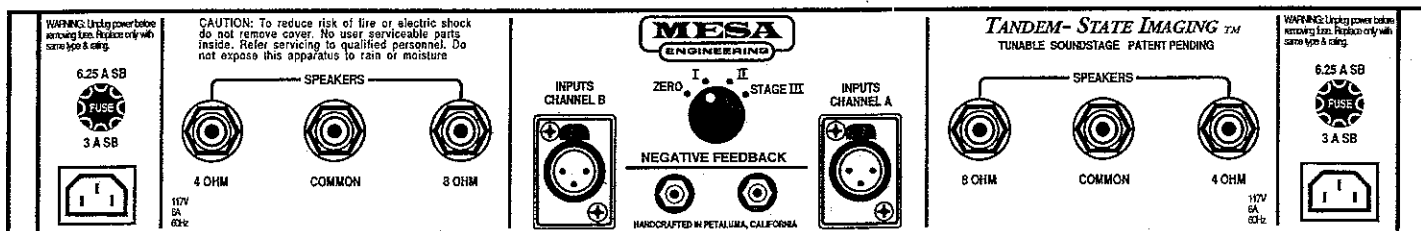


OVERVIEW: (Continued)

REAR / TOP VIEW: TUBE BAY



REARVIEW: BARON



INSTALLING YOUR MESA BARON

Choose a good location:

Ideally, the location should provide ample ventilation, minimize the length of speaker cables and place the amplifier safely away from accidental contact by children or pets.

Ventilation:

Being a high-power vacuum tube amplifier, the BARON generates heat. Make sure your location provides plenty of free air above and around the amplifier. Do not install it in an equipment rack, in a closed cupboard or in a closet unless ample forced-air fan cooling is provided.

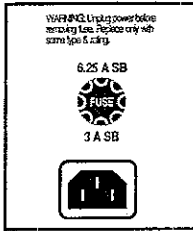
If you are uncertain as to the suitability of your location, monitor the temperature. After several hours of operation, the BARON'S transformer covers and the switches on its Rear Deck will normally become very warm to the touch. If they become too hot to touch, then ventilation is inadequate.

REAR PANEL CONNECTIONS:

A.C. POWER :

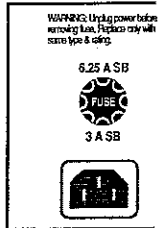
Being a true *Dual-Mono* design, each channel of the BARON is powered independently. At full audio power the total consumption for both channels is about 10 Amps @ 117 Volts. Thus, a 15 Amp or larger circuit is adequate.

The two A.C. power cords that are supplied with your new BARON are quite substantial and are sonically neutral. After-market power cords can and will exert a noticeable influence over the BARON'S sound. These cords may be selected for sonic tuning in each individual system. Make sure both A.C. Cords are firmly in their socket (receptacles) before powering up the unit.



FUSES:

Each channel of the BARON includes its own A.C. Mains fuse located on the Rear Panel of the chassis. Should a fuse blow, first remove the A.C. power cord then replace the fuse with the same type and rating only. For U.S., Japan or any system providing 100 volts to 120 volts A.C. power, the fuse rating should be a 6.25 amp Slo Blo type. If Slo Blo's are not available, a normal (fast blow type) should be adequate as long as the soft-start procedure is followed.



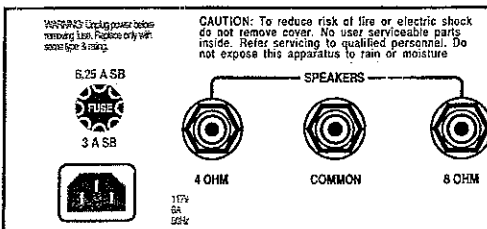
For 220 to 240 volt mains, a 3 amp fuse should be used. Slo Blo types are often very difficult to find in Europe and a fast blow fuse will be adequate when using the soft-start. Because fuses are "filamentous" devices, they may cause degradation of sonic performance after a few years of service. So even if a fuse has never blown, we recommend replacing the mains fuses whenever the BARON is re-tubed. For helpful information on diagnosing and curing a blown fuse, see the Technical Discussion section at the end of this manual.

NOTE:

Caution...Never replace a fuse with one of a different type or rating and never try to bridge the inner contacts of the fuse housing in order to restore power should you ever blow a fuse and one is not available. Don't get desperate! Either one of these two actions could cause a serious fire hazard and/or damage the BARON beyond what might have otherwise been a simple problem.

CONNECTING THE SPEAKERS:

The best location for the BARON would minimize cable length to the speakers. The high quality binding posts on the Rear Panel will provide very firm attachment for your speaker cables. You may tighten them CAREFULLY using a wrench or socket, but these are not automotive bolts and wrench-type leverage can easily crush the plastic spacers. Just snug down the connections a little firmer than finger tight...that's all.



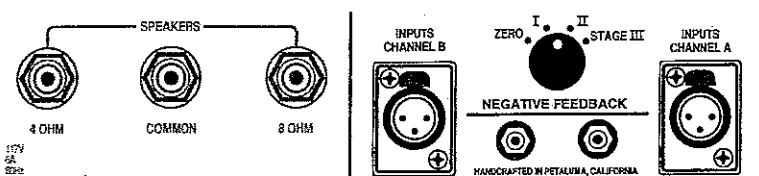
Because the BARON does not invert signal phase, the center Common terminal should be connected to the BLACK speaker terminal...unless you need to compensate for an inverting preamp.

Impedance mis-matching with the BARON is not critical. If there is doubt about how to connect say, a 6 Ohm load, audition both 4 and 8 Ohm connections and select the one providing the best musical performance.

INPUT SIGNAL:

The BARON requires an unbalanced input signal which can be connected to either the gold plated RCA connectors or the 3-pin XLR connectors. Pin 2 of the XLR is wired hot, pins 1 and 3 connect to ground. If a balanced signal is connected to the XLR, the BARON

will operate normally, however, one of the signal legs will be shorted to ground, thus precluding the hum-cancelling effect of the balanced cable. When hum is not a problem in balanced systems (and most of the time it isn't,) the BARON works very well. Shorting one balanced leg to ground will appear to reduce the



INPUT SIGNAL: Continued from page 3

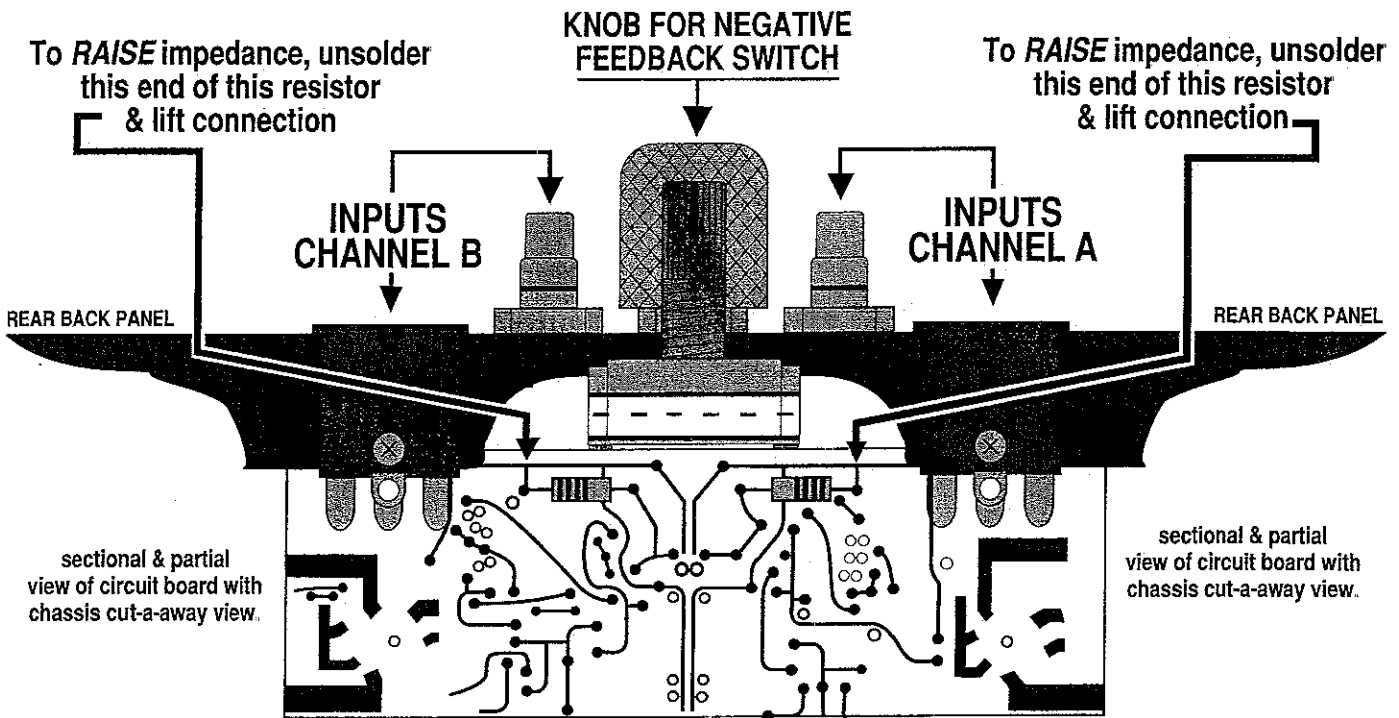
input sensitivity (compared to the RCA connector) but this also has not been a problem.

INPUT IMPEDANCE:

The BARON'S nominal input impedance is 60K Ohms. However some systems may benefit from the reduced loading of an even higher impedance thus the BARON is set up so it can be changed to 110K fairly easily. You must turn the amplifier over and remove the bottom.

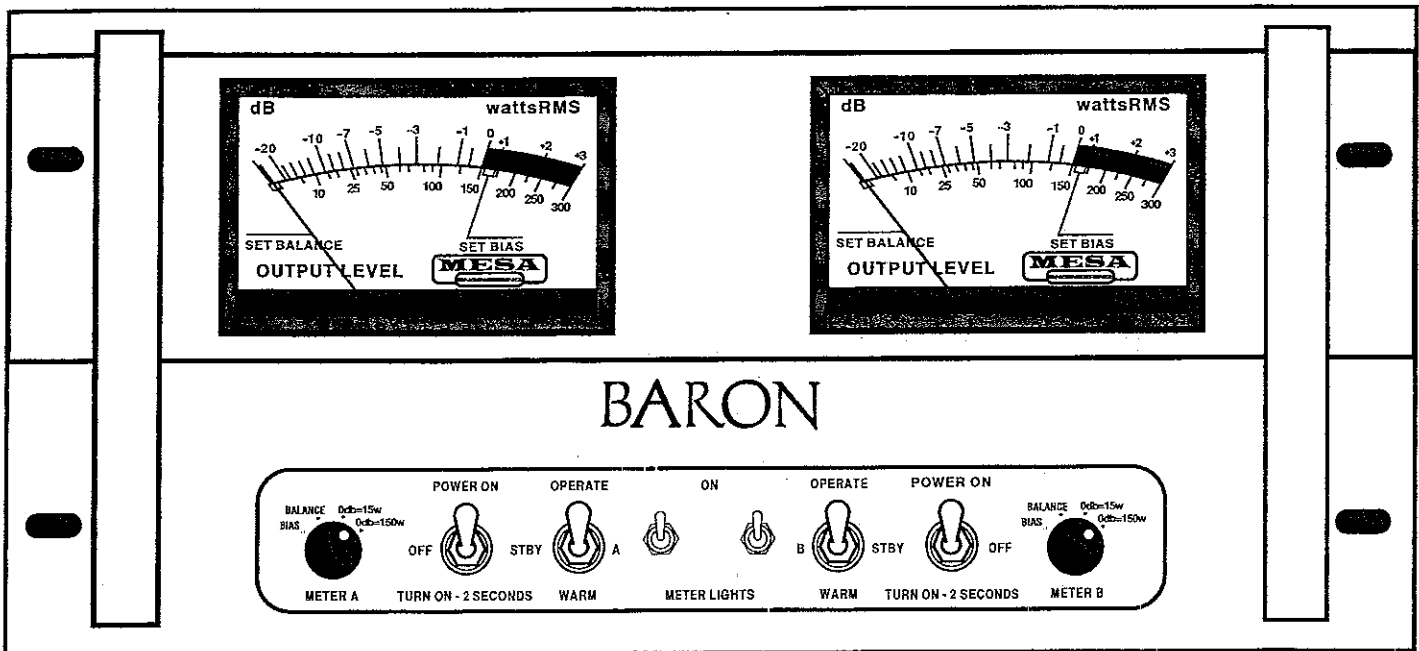
On the printed circuit board almost underneath and to the right & left of the Negative Feedback switch (see illustration below) you will find two separate 100K Ohm resistors (brown-black-black-orange) for each channel. These are currently wired in parallel to give 50K (and are in series with the 10K.)

The higher input impedance may be obtained by merely unsoldering and lifting one end of one resistor per channel as shown in the illustration below. That way it can easily be re-attached if your system benefits from the lowered value. As our boards are soldered and washed using aqueous solutions, you will find it very helpful to first *tin* the joint with fresh solder (and its flux) before trying to remove any soldered part.



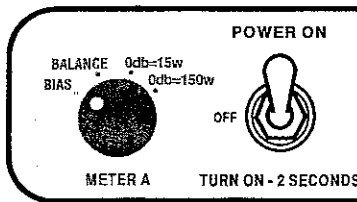
NOTE: This is the BARON looking in from the bottom with the cover removed. The usual warning applies - modification should be performed by qualified service personnel only. Be sure unit is unplugged and all current is drained off before attempting this modification.

FRONT PANEL, METERS & CONTROLS



POWER ON:

Always check that both channels are switched to STANDBY before turning on the Power. This prevents high voltage from being applied to cold tubes and thus extends their toneful life substantially. The A.C. power switches are 3-position, center-off, and include a momentary soft-start position. Push down one of the power switches to its TURN ON position, hold it down for 2 seconds, then switch it all the way up to the ON position.



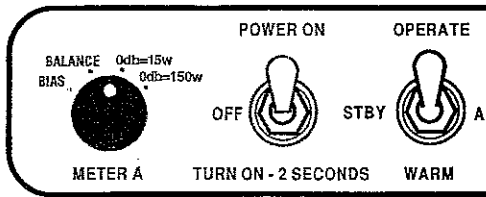
When held down in the spring-loaded TURN ON position, the soft-start circuit eradicates what would otherwise be a momentous surge of in-rush current. Within two seconds the main bank of filter capacitors are charged to 90% and the tube heaters have passed their cold-current condition. If you have the meter lights on during TURN ON, you can see the soft-start in action as the meters smoothly come up to 90% illumination before you toggle the power switch up to the OPERATE position.

Do not hold the power switch down more than 5 seconds. As the meter illumination clearly indicates, 2 to 3 seconds is ample time for Turn On charging to occur. If you occasionally forget to use the soft-start Turn On procedure, don't worry. The BARON is designed to withstand hundreds of Turn On jolts without damage. However, you may encounter one of the following conditions:

- 1.) One or both of the the BARON'S power fuses may blow. Merely replace it with a similar 6 25 Amp Slo-Blo type. If this type of fuse is unavailable, you may use a fast blow type of similar amperage, but it will probably blow if the Turn On procedure is ignored.
- 2.) Your house circuit breaker may trip. If so, reset the breaker and turn on the BARON once again utilizing the soft-start procedure.
- 3.) The power switch may "weld up" and fail to turn off when moved to the center position. If this occurs, remove the A.C. power cord then snap the switch toggle up and down several times and the contacts should free themselves, returning everything to normal again.

STANDBY SWITCHES:

After following the TURN ON procedure, wait about 30 seconds then toggle the STANDBY Switches down to their WARM position. This applies half the operating voltage to the tubes and the BARON'S circuitry. If you intend to begin listening now, move the switches up to their OPERATE position. Passing through the WARM setting softens the surge of current to the amplifier thus prolonging tube and capacitor life. You will notice that the POWER and STANDBY Switches both follow the same sequence: Center OFF, then down momentarily, then up to OPERATE.



You may also leave the BARON in its WARM position for extended periods (days, weeks and even months) thus keeping it stable and always ready for the next session. Power consumption and heat generation are greatly reduced compared to leaving the amplifier in its OPERATING mode. The experience of many older studio pro's suggests that leaving an amplifier in this reduced high-voltage mode during periods of dis-use actually extends tube life and reduces the likelihood of noise, compared to powering fully off.

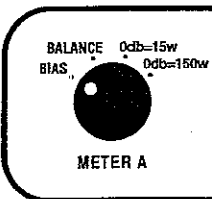
In any event, we recommend removing the A.C. power (even unplugging the cords from the wall) whenever lightning storms are likely to occur. Even though each BARON contains four Varistor type surge protectors, they will (probably) save the amp but may sacrifice themselves if hit hard by a lightning induced transient.

You will also find the center STANDBY position very convenient when changing cables or comparing different pieces of equipment. High voltage is removed entirely from the amplifier circuitry (while the tube heaters remain ON) and thus there will be no distracting or damaging noises while changing connections and no distracting delay waiting for the amp to warm up again.

If you forget to use the STANDBY function during warm-up, don't worry. You haven't caused any damage. (Actually the two most "musical instrument" aspects of your BARON are its STANDBY Switches and its professional reliability -- especially its tolerance for abuse!)

CHECKING & SETTING THE BIAS:

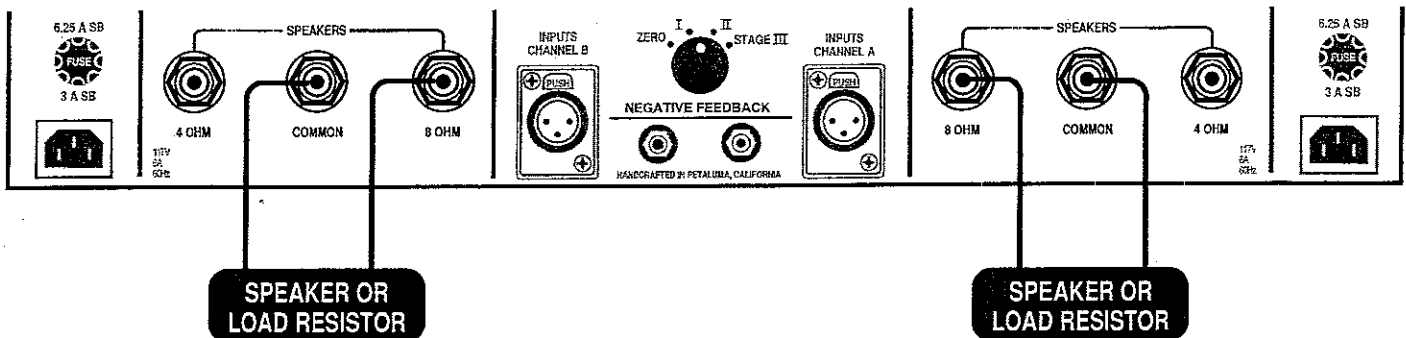
In keeping with our philosophy of *reliability and service* simplicity, your Mesa BARON is designed for easy bias maintenance. To check or set the BIAS, follow the simple



procedure below:

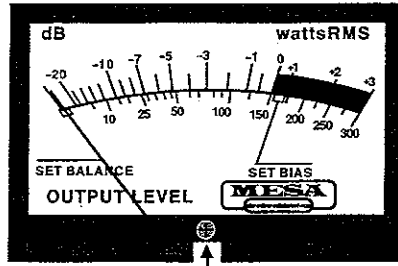
- 1.) Make a visual check that a speaker (or load resistor) is connected to each channel and that no signal is present at the amplifier's input terminals.

NOTE: *Never operate a tube amplifier without a load on the speaker terminals. Even a dead short is vastly preferable to open terminals. If the amplifier were to receive a strong signal without a load, very high A.C. voltages will be generated across the output transformer and an arced tube or transformer may occur. See illustration below.*



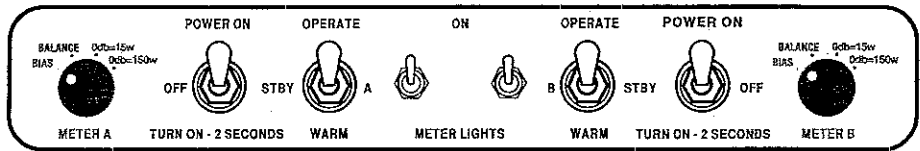
CHECKING & SETTING THE BIAS: *Continued from page 6*

2.) Check that the meters read zero. If necessary, re-set the mechanical adjustment screw on the meter face.

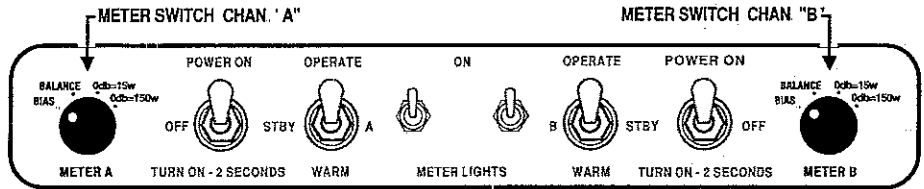


Location of meter adjusting screw - one per meter

3.) Set the Power and Standby switches of both channels to their OPERATE (UP) positions, following the Turn-On procedure as described above

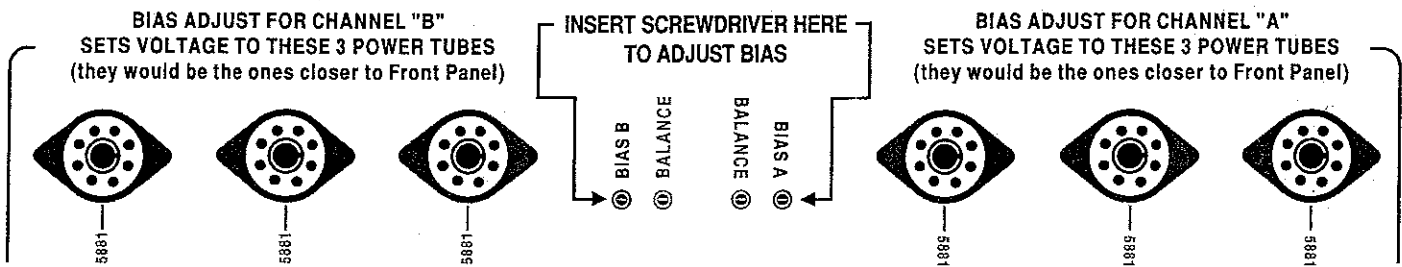


4.) Rotate the Meter Switches to their BIAS positions and observe the Meter readings:



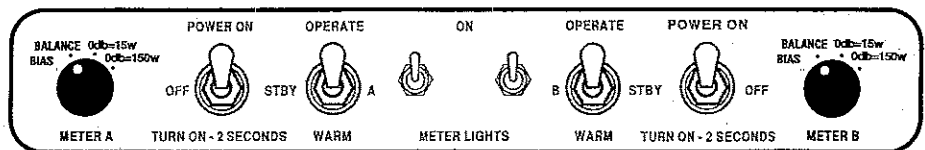
The Meters are very sensitive, so small deflections are of no consequence and most deviations are caused by changes in your home's incoming power. Often these line voltage fluctuations are visible and you will notice slight movements in both Meters simultaneously. If your BARON is fed from a line power regulator, these voltage changes should not occur and the BIAS settings will be much more consistent from week to week.

Adjusting the BIAS is very simple and the procedure is the same for both channels. Starting with Channel "A", merely insert a small screw driver into the corresponding Trimmer located on the top of the amplifier's chassis and adjust the BIAS to the indicated Meter BIAS reading.



CHECKING & ADJUSTING THE BALANCE:

The procedure is the same as adjusting the BIAS, only now turn the Meter Switches to the BALANCE position. Again, due to the high sensitivity of the Meters, some deflection from a "perfect" zero BALANCE Meter reading is normal.

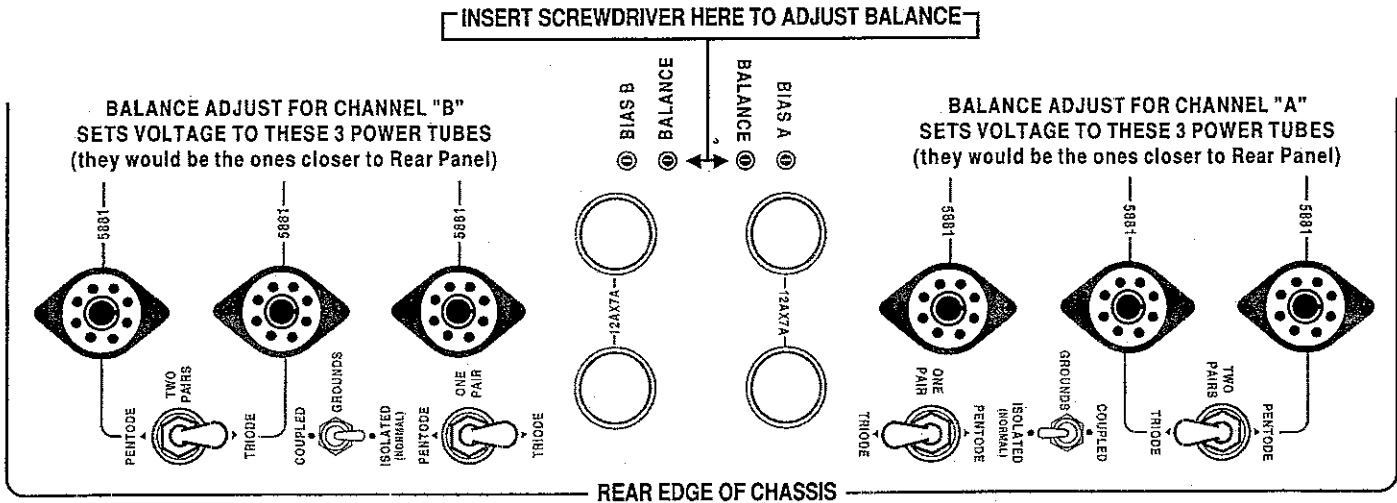


To precisely dial in the DC Balance of the output tubes, adjust the Trimmer marked BALANCE until the Meter shows zero

CHECKING & ADJUSTING THE BALANCE:

Continued from page 7

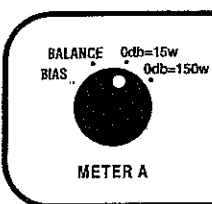
deflection, as indicated by the BALANCE marker on the Meter's face. This adjusts the BIAS setting for the three power tubes closer to the rear edge of the chassis by comparing their idle current to that of the first three power tubes that you previously biased.



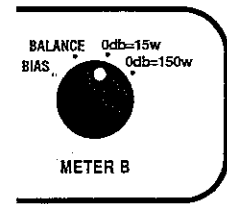
Thus, adjusting the BALANCE Trimmer for zero offset insures that accurate DC Balance is maintained in the BARON'S Output Section - even if the power tubes in a channel happen to age differently.

For further information refer to the Technical Discussion section near the end of this manual.

USING THE METERS FOR AUDIO:



If you are following the set-up procedure thus far, turn the Meter Switches two clicks to the 0db=150 watts position before playing music through the BARON. If the needles are seen to be barely moving at your chosen listening level, you may want to switch up to 0db=15 watts in order to achieve a more accurate monitoring window at lower overall output levels.



You may be impressed by the logarithmic nature of perceived loudness: A few watts may sound fairly loud; doubling the output wattage will sound only a little louder. Thus even a high power amplifier may see loud musical peaks use up its full power resources. With some speakers you may be able to drive the BARON'S Meters well into the red zone during big bass transients - yet distortion will likely not be audible. Even complex layers of mids and highs will emerge virtually un-smearred during these clipping episodes due to the high energy storage of the main bank of filter capacitors. Do not try this with highly efficient or delicate speakers (or neighbors !) as damage is very possible.

Meanwhile, the BARON itself electronically has no trouble operating at or above clip. Why would anyone do that, you ask? Remember our background as builders of high performance musical instrument amplification and note that a typical guitar amp developing say, 100 watts at clip, will often spend half of the night - every night - pushing out 180 to 200 watts. Yes, it's massively clipped - and that's a big part of the Rock and Roll Tone - cultivating the distortion sound that makes hit records! You don't have to like it...but isn't it comforting to know your amp is built to handle it!

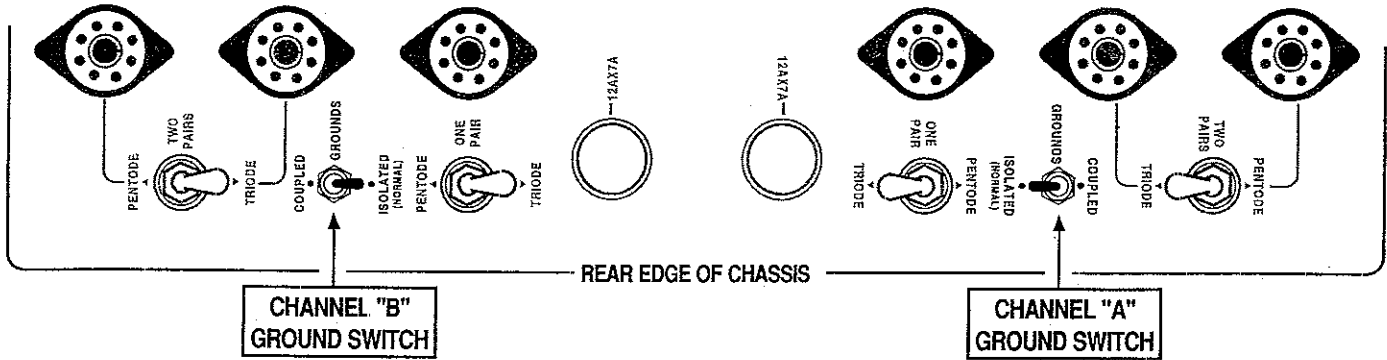
NOTE: Never allow the Meter Needles to slam repeatedly against their stops and do not play music through the BARON with the Meters set to either Bias or Balance.

METERS: If you wish to turn off the Meter illumination, two mini-toggle switches have been provided for just that purpose.

USING THE GROUND SWITCHES: On the Rear Deck of the BARON'S Chassis (see illustration below) are a pair of mini-toggle switches which you will probably set once and afterward leave alone. The easiest way to understand the function of these switches is to

USING THE GROUND SWITCHES:*Continued from page 8*

consider the BARON as having two separate *reference groups* to ground: one external and two internal. The Internal Grounds are the common zero voltage points for the power supply and audio circuitry of each channel. The External Ground is the safety connection of the metal chassis to your home's Ground circuit.



In the Normal position, the switches isolate each of these two different Grounds. **In the Coupled position** they are connected together. Normally these two different Grounds are connected together at some point in every system, otherwise some form of cycle hum and pesky buzz type interference will result. But if they are connected together in more than one place, then hum and buzz may again occur; this time as a result of a Ground Loop. If your system hums and buzzes with the BARON'S Grounding Switches in one position but not the other, then you will be forced to choose the more quiet of the two.

However, it is far more likely that there will be *no* audible hum or buzz in either position. If this is the case, then careful listening may reveal a sonic difference between settings of the Ground Switches and the Isolated position will probably provide a more open and spacious soundstage.

TANDEM-STATE IMAGING: patent pending

Here is where your BARON becomes uniquely enjoyable to operate:

Tandem-state Imaging (TM) enables you to tailor the amplifier's sonic performance to better suit your room, your speakers and the music you play.

Simply stated, Tandem-State Imaging gives you incremental control over the amplifier's negative feedback and its power tube operating characteristics.

Negative feedback is a common, though controversial, circuit technique which is used to reduce an amplifier's distortion and flatten its frequency response. (For a more complete explanation, refer to the Technical Discussion later in this manual.)

In addition to the four-position Negative Feedback switch, power tube characteristics are individually switchable between Triode and Pentode operation. Two toggle switches are supplied for each channel. One switch controls one pair of power tubes and the other switch controls the remaining two pairs of tubes. This way every combination is available from all Triode to all Pentode including 1/3 Triode plus 2/3 Pentode, and 2/3 Triode plus 1/3 Pentode.

The incremental sonic differences between each setting are intriguing. In your particular system you will probably have one favorite setting and one or two alternate settings for different moods and different types of music.

All of the Tandem-State Imaging switches may be safely used while music is playing, so making instant comparisons is easy and interesting.

Less noticeable is the change in maximum power availability which ranges from nearly 150 watts -- full Pentode -- to about 60 watts--all Triode. (For more information, refer to the Technical Discussion later in this manual.)

WHY TANDEM-STATE SWITCHABILITY?

Different amplifier types are renowned for their individual abilities but as any particular virtue becomes stronger, other characteristics often suffer in proportion and the universality of a given design becomes limited.

For example: A low power triode amplifier with little or no negative feedback may be unsurpassed for bringing lushness to the playback of acoustic instruments in a chamber setting. Realistic listening levels are attained with minimal amplifier wattage and the relative absence of dynamic extremes requires minimal amplifier control of the speakers.

At the opposite end of the performance spectrum, high power pentode designs are often better for playing back modern electronic music where bass fundamentals require considerable -- and fast -- amplifier power with enough negative feedback to keep speaker motion tight.

Not only does Tandem-State switchability fulfill these two extremes (of music and amplifiers) it also addresses the performance continuum in between with incremental switchability. Thus the jazz combo backing up a vocalist may sound better by adding one pair of pentodes and one stage of negative feedback. The symphony orchestra may benefit from two pairs of pentodes. It depends on your speakers, your music and your listening preferences.

The important fact is that Tandem-State Imaging allows you to switch through an entire range of amplifier performance characteristics -- while the music is playing -- so you may easily find the best sounding combination.

In general, as the music becomes more dynamic, more complex and more extended into the frequency extremes, adding pentodes and adding negative feedback becomes more and more appropriate.

What has surprised many BARON owners and reviewers alike is that after first being seduced by all Triode, most begin to prefer some pentode added in...often settling on 1/3 or 2/3 pentode as the best match for their system. We find that gratifying because prior to the BARON and its Tandem-State Imaging, these combination-settings were not previously available.

With Tandem-State Switchability factored in as part of the BARON'S musical equation, we have strived to create a reliable, and versatile amplifier that sounds neither "solid state" or "tubey" by combining the accuracy of one with the other's emotionality. We encourage you, the listener and BARON owner, to freely use its many features both for the interest they provide and for their ability to help bring your music to life.

Our devotion to High End Audio is dedicated to helping re-create a previous musical performance in "virtual reality" because the mission is always the *music itself*, and the sublime insight it provides into the heart, soul, wit and intelligence that defines human genius. Please enjoy. *Thank You.*

ADDENDUM: TECHNICAL DISCUSSION

NEGATIVE FEEDBACK:

A landmark development in amplifier design, negative feedback has become somewhat controversial in High End -- for the simple reason that it has been grossly overused in some designs of the past. Applied properly and sparingly, negative feedback can be highly beneficial to amplifier and system performance. But the amplifier must first be able to work well without it.

Negative feedback is a corrective technique wherein a portion of signal voltage is taken from the speaker terminal and fed back into the amplifier's input, but out-of-phase with the original input signal. Because it is of opposite phase, the feedback is termed "inverse" or "negative" and it works by CANCELLATION to reduce amplifier inaccuracies. Here's how:

NEGATIVE FEEDBACK: *Continued*

First, note that any signal components appearing at the amplifier's output which were not present at its input are -- by definition -- distortion. Then picture the cancellation effect of negative feedback as being equivalent to a reduction in circuit gain: The amount of output -- of both distorted and non-distorted signals -- is reduced.

Example: Take an amplifier with 2 percent distortion and add 6 db of negative feedback. The output (of both signal and distortion) would then be reduced by half. Now double the amplifier gain to compensate for the reduction and the original full strength output will be restored. However, the distortion elements will remain at the reduced level because the amplifier only amplifies signals appearing at its input and the distortion was generated internally -- after the input. Thus the overall amplifier gain and output returns to 100% but the distortion remains halved and now represents only 1 percent of the total.

You can see how this could be a seductive solution for the designer because negative feedback -- like a cheap perfume -- may be used in increasing strength to hide a multitude of sins. Distortion specs and frequency response always improve as more and more feedback is added. But problems occur when the designer tries using negative feedback to cure inherent amplifier flaws -- mainly because the distortion must first begin to appear at the output before it can be fed back as a remedy. So while negative feedback may work well on steady-state lab signals and virtually eliminate distortion even in flawed designs, it is not nearly so successful in the musical domain where the story is told in precious nuances of musical expression.

Think of the instant a note begins...from a piano, a cello or a woman's voice (much less a snare drum!) and note how much vital information is conveyed in that instant about the artist and the room environment. If negative feedback is over used to compensate for poor amplifier response, then each musical attack is molested as the amplifier first reveals its flaws then stumbles into correction. The lag time may be extremely short but audible degradation nevertheless occurs because the music is always changing (unlike the sine-wave lab tone) and the feedback can never catch up.

However an amplifier which can deliver good musical performance without negative feedback, may benefit by using it to improve system matching. This is the approach taken with the BARON as borne out by the adjustable feedback switch. Like many owners, you may find your system sounds better when using some negative feedback. Again, alot will depend on the speakers, the room and individual musical taste.

As far as those distortion specs alluded to earlier, in the BARON'S all important mid-band, distortion with zero feedback increases to about one percent at the onset of clip. At typical listening levels it is far below that, though whether it is .08% or .8% cannot be determined by listening. (It is closer to the former.)

The one area where the BARON specs the worst is one of its strongest sonic virtues, the bass range. Quite simply, there is not enough iron in its outout transformers to deliver anywhere near full power at 20 hz. Yet larger transformers *sounded* no better in the bass and far less transparent in the highs -- though they did spec out properly at 20 hz. We chose sonics over specs.

DIODES, TRIODES, PENTODES & IRISHMEN:

With apologies to Friends and Relatives from the Emerald Isle--who will make their appearance soon enough--the humor which follows is dedicated to the memories of Spec McAuliff and Fae (Rafael) McNally, two of the True Greats.

As their numerical references suggest, the terms Diode, Triode and Pentode indicate the number of elements within the vacuum tube i.e. two, three and five. All tubes also require a filament or heater which is not included in the count. Its purpose is to excite electrons from the cathode coating by raising the temperature such that they are able to "boil out" of the electron-rich coating material and form a cloud of free electrons in the vacuum space surrounding the cathode.

Although the terms "filament" and "heater" are often used interchangeably, there are specific differences: A filament is a directly heated cathode where the cathode coating is applied directly to the heating element. Examples are 5U4 twin diode rectifier and 300B triode amplifier.

DIODES, TRIODES, PENTODES & IRISHMEN: *Continued*

A heater, on the other hand, is a heating element which is separate from the cathode and is usually inserted within the tubular cathode sleeve. Examples are 12AX7 twin triode amplifier and 6L6 or 5881 beam power pentode. In all cases this fundamental aspect of each tube's construction is clearly visible, especially when the heating element is glowing red hot.

The cathode, then, would be considered the first numbered element because it is the source of the electrons. The word itself is from the Greek literally meaning "completely down" which implies a sense of central origin--like the center of the Earth (where Tone begins.) And it might be said that an ecstatic audiophile experiences a positive "catharsis", his soul being purified when his system transports him to audio Nirvana.

The only trouble with taking this positive imagery too far is that the cathode is, unfortunately, negative...at least electrically speaking. However this is easily remembered since virtually all musicians and audiophiles have also experienced the more common "negative catharsis" where they emerge from the emotional rebirth kicking and screaming in rage and frustration.

Once heated, the intrinsically negative electrons are energetic little fellows of almost no mass. Thus they may be accelerated almost instantaneously and will travel through a vacuum at nearly the speed of light. Being of like, negative charge, they tend to repel one another and thus within the electron cloud surrounding the cathode, there is much jostling and elbowing as each one tries to maintain his distance from all the others...unless there is a strong and universal attraction from an outside influence.

Visualize, if you will, a group of sub-atomic Irishmen milling about and in a repellent, negative state of mind. All are scowling and none wants to have anything to do with the other. Now introduce a strong attraction say, a public bar, and you can easily picture an orderly, if rapid movement of the lot in a single direction. This is what happens when a positively charged element called the "anode", or "plate" is introduced into the vacuum.

The plate is the large metal element most prominently visible through the glass of an electron tube. It is the outer most element of a tube's structure and it surrounds all the others. The cathode is at the center radiating electrons outwardly. As higher and higher positive voltage is applied to the plate, the attraction for the electrons surrounding the cathode is increased and with nothing standing in the way, full uninhibited flow to the plate occurs... sort of like removing the doors and offering free drinks to the crowd of surly Irishmen milling around outside. And as electrons flow to the plate, the space charge will continually be replenished by further "boiling" of the hot, electron-rich cathode as you can easily imagine other Irishmen impatiently taking up the places of those who've gone inside--until the entire village is deserted.

Now, where do they come from and how do they emerge? Well, a grand and elegant lady once showed me how to revive flat champagne: She dropped a raisin into the glass. There was a dramatic and immediate increase in effervescence with the introduction of a "cathoding" surface. Thousands of tiny bubbles suddenly appeared--and continued to flow from the raisin. Of course the bubbles were made up of gas dissolved in the beverage but the analogy makes it easy to visualize the loosely bound electrons dissolved in the rich cathode coating as they "effervesce" from its heated surface.

But back to electron flow. If the electrons are strongly attracted to a positively charged plate, then it follows that they are strongly repelled by a negatively charged plate, and they are. Thus, if an alternating current--such as comes from a transformer--is applied to the plate, electrons will flow only during the times when when the plate is positively charged. During periods of negative plate charge, electron flow is stopped and the space charge of electrons remains compressed in the area around the cathode.

Thus a diode tube--one with a cathode and an anode--is mostly used to "rectify" alternating current into direct current by passing it without restriction but in one direction only. This also explains why closing time is strictly enforced at Irish Pubs: During normal operation the traffic flow is similarly unimpeded and uni-directional--toward the bar--and this process rectifies the work-day negativity. It goes without saying that no one leaves as long as the atmosphere around the bar remains positively charged.

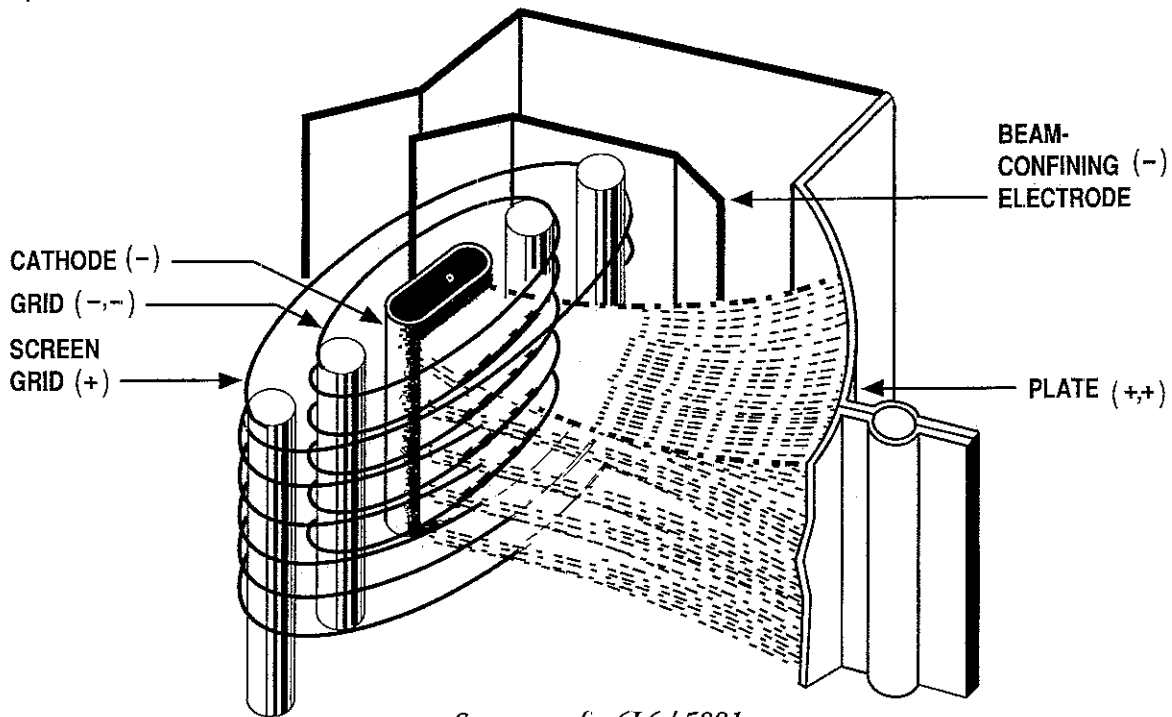
DIODE, TRIODE, PENTODES & IRISHMEN: *Continued*

TRIODES:

This section is a continuing technical treatise on the workings of Irish Pubs but to make it easier for the layman to understand, it is explained in terms of vacuum tube technology.

Remember the original bar-free beer and no doors? Well, it turns out that some control over the flow can be a necessary and useful advantage. This led to the invention of those swinging louvered bar doors which are open at the top and bottom. They are patterned after the control grid of a vacuum tube, which is a loosely wound coil of thin wire located between the cathode and the plate.

In a Triode the plate is always positively charged with high voltage DC and even though the grid is there blocking the path, those negative electrons can still FEEL the strong attraction--just as the Irishmen can see in through the louvers of the bar doors. They know what pleasures lie beyond. But to get there requires overcoming the negative influence controlling the access. This negative influence is typically called a BIAS. In electronic terms that means the grid is supplied with a voltage which is slightly MORE NEGATIVE than the already negative electrons. And the more negative the bias, the more it tends to neutralize the attraction of the plate and repel the electrons back toward the cathode.



*Structure of a 6L6 / 5881
Beam Power Pentode.*

The Irish can be similarly charged with bias but unless you are Irish yourself, this type of biasing may be more difficult to understand. The effect is similar though: The more negative the bias, the more it impedes forward progress

Generally speaking though, the electronic bias of the grid is easier to overcome, and for two main reasons: First, the bias is set-like the bar doors--to allow some passage. Second, the grid is mostly NOT THERE, like the louvered doors which are mostly open spaces. Unlike the plate (which is solid), the grid is like a coiled bed spring. It can create a repelling field but mostly it's empty space in between widely separated windings of wire. And it's very easy to control the electrons as they pass through the grid's force field: Changing the grid voltage only slightly will have an enormous effect on how much current flows through. And that's what AMPLIFICATION is: a small change in voltage at the grid causing a large change in current flowing to the plate.

The purpose of the louvered bar doors is similar to that of the grid, namely, to give momentary pause while still revealing the promise within. Hesitation mostly gives way to temptation but there are those few stalwart Irishmen who think twice and decide to

DIODE, TRIODE, PENTODES & IRISHMEN: *Continued*

come back later. Most just pause slightly then go on through. That is the purpose of the bar doors: to prevent everyone from crowding in all at once. And as the door is made less of a barrier (wider spaces between the louvers) more of the bar's attractive influence is felt outside thus amplifying the customer flow and increasing the crowd at the bar.

PENTODES:

Occasionally though, bar doors—even the louvered type—were found to be too effective, and too many customers turned away. Something further was needed to increase the attraction of the bar and overcome the resistance created by the door and so the cocktail waitress was invented.

Once again the idea was inspired by the vacuum tube. It had been discovered in some tubes—often large power types—that the distance to the plate was too great to attract enough electrons past the negative influence of the control grid. So another grid coil of fine wire was inserted between the first grid and the plate. This was called the SCREEN GRID and carrying a highly positive charge, it functioned as "bait" for the plate.

In a properly designed power tube such as a 6L6 or its industrial brother the 5881, the windings of the screen grid are precisely aligned to fall in the shadow of the control grid. This way electrons responding to the pull of the screen grid are lined up in sheets as they pass between windings of the inner control grid...only to find they've been fooled! Once past the control grid and drawn toward the screen grid, they discover...there's almost nothing there. The path they're on has them aligned to zing straight through the spaces BETWEEN screen grid windings. So rather than a close and personal encounter, they just fly on past. And once they're out that far, there's no stopping them. The influence of the plate takes over and—being solid metal and of the highest positive attraction -- it is at this final destination that the electrons congregate.

Thus the proper cocktail waitress -- visible through the louvers—is scantily clad so as to be all the more effective at reinforcing the attractive influence of the bar. And by being located in between the door and the bar, she serves as bait to lure the customers past the door's negative influence.

Once through the doors however, it is the rare Irishman who actually comes in personal contact with the cocktail waitress as, for all intents and purposes, she -- like the screen grid -- turns out to be a vanishing illusion. Yet, having come this far, the solid influence of the bar itself now takes over and attracts the customers to congregate, having happily reached their destination.

Since each channel of the BARON uses three pairs of power tubes, two separate Triode/Pentode switches are configured so you can hear any combination of characteristics and sample for yourself the extra juice provided when those wenches lay bait to the plate.

If you're still following this and haven't lost track of the count, you'll know we're still one element short of the five needed to make a pentode. This last part is a pair of beam confining shields which being negatively charged, serve to direct the flow right toward the plate. This is much the way a short entrance hall to the bar prevents wandering accidentally into the Men's room on the way.

Once at the bar though, the circuit is complete and the process of soul-nourishing works its ritual magic. Biases having been overcome, illusory nightingales having vanished, the spirits truly soar and the once surly Irishmen now are filled with warmth, wit and kindred friendship, enjoying the music and glowing nicely with their heaters on.

REGARDING BIAS:

We will now leave the Land of the Leprechan and return to serious matters, discussed seriously. Sorry for the diversion.

Through extensive listening tests we have determined the optimum bias setting for the BARON'S 5881 power tubes and that corresponds to an idle current of 38 ma. per tube. Thus when the meter indicates a properly SET BIAS, the corresponding three tubes together draw an indicated total of 114 ma

Not only does this setting deliver the sonics we prefer, but it is a conservative setting for tube life and reliability. It is acceptable (though not recommended) to run the tubes hotter by adjusting the Bias Trimmer for meter readings UP TO "2.5 db" which

REGARDING BIAS: *Continued*

corresponds to 150 ma. Then re-set the BALANCE for zero offset. Each tube would then be drawing 50 ma. and though this is not yet quite their rated maximum, it is close and they will run VERY HOT, have a shorter life span and an increased chance of failing.

For the curious/bold amongst you, the following list is provided to help you convert indicated meter readings into total current. Never operate the BARON with current exceeding 150 ma.

WHEN THE METER READS	THE TOTAL CURRENT IS
+2.5 db	150 ma.
+2 db	142 ma.
+1 db	126 ma.
SET BIAS	114 ma.
0 db	110 ma.
-1/2 db	105 ma.
-1 db	99 ma.

Remember to divide by 3 to get the current per tube and note that the meter measures cathode current, which includes screen current with the plate current. Screen current at idle typically runs around 1 ma. per tube.

In our opinion, the best sound quality with 5881's is at the factory settings. This is a virtue we seek in our instrument amplifiers as well, a "sweet spot" (and a moderate one at that) for the bias setting. This runs contrary to some conventional thinking which holds that as an amplifier is biased to run hotter--and therefore more Class A--its performance will continue to improve until things start melting down! That would imply that any setting is a trade-off between sonic performance and reliability. With the BARON, that is, thankfully, not the case...although the distortion specs for the high frequencies will be dramatically improved at high-current settings.

TUBE SUBSTITUTIONS:

Because the adjustable bias feature is so convenient, die-hard "Tube Rollers" may--AT THEIR OWN RISK--wish to swap tubes with the BARON. DAMAGE TO THE AMPLIFIER MAY OCCUR IF A POWER TUBE SHORTS. Unlike most of our guitar amps, it is not possible to make the BARON immune to damage from severe power tube failure.

Remember, The BARON has been voiced to perform best with the Russian 5881 tubes supplied, which, though they produce less power than many 6L6's, are clearly the preferred choice for many reasons.

Substituting tubes will definitely alter sonic performance but almost certainly not for the better. And because severe damage may occur, it is not recommended and will void your BARONS warranty. Thus the following section is more for the curiosity of those interested rather than a recommended procedure. If there were a better choice of tube than the 5881, we would have used it!

But if you must...6L6 GC is the first alternate with the best choice being the Sylvania STR415 that we developed with the factory. Unfortunately the factory is now closed and our limited supply of these high power, super robust tubes is dedicated to critical guitar amp maintenance. The Fender version (STR 387) would also be adequate although many of the STR's available now are ones we rejected (as being unreliable) from the last Sylvania production run.

TUBE SUBSTITUTIONS: *Continued*

There is currently available a new Chinese version of the STR 6L6 design and while it appears quite reliable in our opinion it sounds harsh in the BARON, compared to our 5881. We are consulting with the factory so future improvements may be forthcoming but this effort is less promising than the time spent years ago at the Sylvania plant and in follow-up evaluation.

The "standard" Chinese 6L6 GC is another reasonable substitute and this one can be identified by its "comb" structure internally. That is, all the support wires are in a row. (resembling a comb) just above the base whereas the STR design (and the 5881's) have the supports arranged circularly. The standard Chinese 6L6 sounds a little harder and brighter than the 5881 and though more powerful, would not be nearly as reliable in BARON service.

Other old or new /old stock 6L6 GC's may be worth a try though we were never impressed by the reliability of the GE's which had a tendency to arc destructively and could cause major damage to the BARON.

Because pin 1 of each power tube socket has been wired to ground, it is also possible to run EL-34's in the BARON. Here again there are so many different versions and so much variability even between batches from the same factory that this compatibility is really more a Mesa "*habit*" but the possibilities may intrigue the bold amongst you.

The Mesa Sylvania STR 416 6CA7 (American type EL-34) sounded pretty good in the BARON...but like the 6L6, availability is a big problem.

Even though we made a few BARONS that used 6550's in one pair of sockets, they are not otherwise recommended unless the screen voltage to these tubes is reduced by approximately 150 volts. If not, noise and catastrophic arcing may occur

Different types of 12AX7 may be substituted with no real fear. The Tesla made in Czechoslovakia will be found to soften the BARON'S sound...but at some expense to the dynamic response, especially bass punch.

Other 12AX7's (and even 12AT7's) may be substituted at will HOWEVER always identify each original tube (both power and preamp) with the socket from which it came. This may be especially important with the 12AX7's because an internal trimmer has been factory adjusted to secure the best AC signal balance. Again, while the accuracy of this adjustment provides a dramatic improvement in distortion specs... virtually no audible difference occurs if it is not reset for a substitute tube. Still, let's keep it right!

DIAGNOSING TUBE FAILURES:

There are two main types of tube faults: shorts and noise. Both large and small tubes may fall prey to either of these problems but diagnosis and remedy is usually simple.

If a fuse blows, the problem is most likely a shorted power tube, Shorts can either be mild or severe. In a mildly shorted tube the electron flow has overcome the control of the grid and excess current flows to the plate. You will usually hear the amp become distorted and begin to hum slightly. If this occurs, quickly look at the power tubes as you switch the amp to STANDBY and try to identify one as glowing red hot. It is likely that three in a row will be glowing since the "shorted" tube will pull down the bias for its adjacent mates, but one tube may be glowing hotter -- and that one is the culprit. The other two are fine -- unless they've been glowing bright red for several minutes.

Because there is no physical short inside the tube (just electrons rioting out of control) merely switching to STANDBY for a few moments then back to OPERATE will usually cure the problem. . at least temporarily. Watch the tubes carefully now. Should the problem recur, the intermittent tube will visibly start to over heat before the others and thus it can be identified. It should be replaced with one from the same color batch, shown on its label. Call us and we will send one out to you. Worst case, unless the tubes are very old anyway, just replace the three on the shorted side with three more of the same colored group. Always check the Bias and Balance when re-tubing.

The severe short is not nearly so benign. In the worst cases, a major arcing short occurs between the plate and the cathode with visible lightning inside the glass and a major noise through the speaker. If this is seen to happen, *IMMEDIATELY* turn the amp to STANDBY while yanking the AC power cord from the rear of the BARON. By this time the fuse probably will have blown but the

DIAGNOSING TUBE FAILURE: *Continued*

current drawn by the shorted tube can be so excessive that the switches may be temporarily "welded" closed.. that's why pulling the cord is recommended. Such a short is usually caused by a physical breakdown inside the tube including contaminate coming loose or physical contact (or near contact) between the elements.

Now...take heart. So far this has never occurred in a BARON with 5881 tubes--which is why we use them and recommend against substituting other types. Remember, the 5881 is a ruggedized, industrial version of the 6L6 and besides being the most reliable, it is the best sounding of the bunch for playback.

Also, the BARON does not apply excessive voltages on the power tubes and they are biased such that plate dissipation (wasted power) runs around 18 watts per tube, far below the max. of 30.

(For overdriven guitar power, 6L6's sound better than 5881's and major shorts do sometimes occur under these conditions. Imagine 3 pairs of 6L6's delivering nearly 300 watts and you get the picture. Mesa/Boogie instrument amps are constructed in such a way that they are nearly immune to even super flame-out melt-down shorts. Many is the pleasantly surprised musician whose smoked-out amp comes right back to life by merely replacing one tube! Unfortunately the BARON cannot be made quite so bullet-proof.)

If a tube has failed and replacing it does NOT restore proper biasing and original sound, then check and replace the 22 Ohm (red red blue gold) cathode resistors. There are four of these resistors per channel located toward the center of the main circuit board and close to the power supply board. These resistors may act as a fail safe and burn out in the event of a power tube short. It is not necessary to return the amplifier to the factory as replacing these resistors is very simple. Please contact us if you need help securing and replacing these resistors

While shorting rarely occurs within the small tubes, their associated circuit components are made to withstand the effects. If one channel of your BARON ceases to function or becomes noticeably distorted -- and the Bias and Balance readings for the output section are normal -- the cause is probably a failed 12AX7. To confirm this diagnosis, use substitute tubes (from the other channel if necessary). Call us and we will send you replacements.

TUBE NOISE:

Often caused by contamination within in a tube, the culprit can usually be identified, and by lightly tapping on the glass, you will probably hear the noise change. Hearing some noise through the speakers while tapping on the 12AX7's is normal however. And the one nearer the input will always sound louder because its output is being further amplified by the second 12AX7.

The power tubes should be all but quiet when they are tapped. If crackling or hissing changes with the tapping, you have probably found the problem. To confirm a noisy power tube, merely put the BARON on STANDBY, remove it from its socket and turn it back on. It will cause no damage to run the BARON briefly with one power tube missing. You may notice a slight background hum, however, as the push-pull becomes unbalanced.

Whenever you are trying to diagnose a suspect tube, keep your other hand ON the Power and Standby switches for that channel, ready to shut them off instantly in the unlikely case you provoke a major short.

If you think you've located a problem tube but aren't sure, we recommend substituting the suspect with the tube from the same location in the other channel. If you think your BARON is suffering a tube problem (the most likely cause) you can do yourself and us a big favor by just following those simple guidelines. You'll probably be successful with much less effort than is required to disconnect everything and haul the unit to a technician who will basically perform the same simple tests. If the tubes are still within their six-month warranty period, we will happily send you a replacement. Just note the color designation on the tube label so we can furnish a match and remember: The unlikely event that one tire goes flat does not mean that you need four new tires!

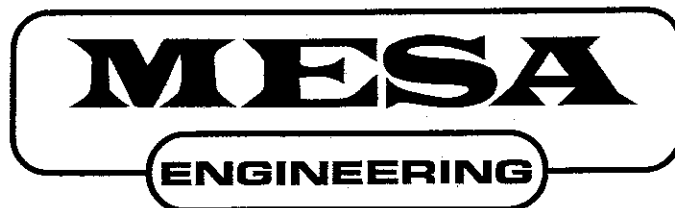
ROUTINE TUBE REPLACEMENT:

Based on our experience with guitar amplifiers, you can expect 2 to 4 years of service before noticing any performance degradation. If none is noticed, and the BARON still sounds great, you may keep right on enjoying the original set with no worries. Often tubes with age have a warmer, mellower sound than fresh ones needing to break in. Should you think it's time to replace, we are pleased to offer original BARON owners the privilege of purchasing replacement tube sets for half price. To qualify, all you need to do is purchase the tubes from us directly.

IN CLOSING:

We *Thank You* for trusting us with your hard-earned audio investment funds. We take this responsibility quite seriously and will do our utmost to become your amplifier company of first choice. More than a business, this is a lifelong passion with many of us here at Mesa Engineering and we appreciate nothing more than hearing from very happy clients who, like us, enjoy the *Spirit of Art in Technology*.

Randall Smith
Designer & President



The Spirit of Art in Technology



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