

# *MESA/BOOGIE*



## Owner's Manual

*The Spirit of Art in Technology*



*1317 Ross Street Petaluma, CA 94954  
USA*

## Hello from the Tone Farm...

YOU, the smart player and all around intuitive human, have put your trust in us to be your amplifier company. This is something we do not take lightly. Our reward is that we've made a classic amplifier and by choosing this amplifier, you have become part of the MESA family...Welcome! Our goal is to never let you down. Your reward is that you are now the owner of an archetypical guitar amp bred of fine all tube amp heritage...benefiting from the many patented pioneering MESA/Boogie circuits that led to the refinement of your new instrument. Feel confident, as we do, this amp will inspire many hours of musical satisfaction and lasting enjoyment. It was built with you in mind, by 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.

# BLUE ANGEL

## Table of Contents

Precautions	
FRONT PANEL: Description & Usage _____	1
Power-Up _____	2
Inputs _____	2
Volum _____	2
Treble _____	3
Mid _____	3
Bass _____	3
Reverb _____	4
Progressive Linkage _____	4
Toggle Switches: On / Standby and Power _____	5
REAR PANEL: Description & Usage _____	5
Fuse and Ground Select _____	5
Reverb Footswitch _____	6
FX Loop: Send and Return _____	6
FX Mix _____	6
Slave Out D.I. _____	6
Speaker (impedance matching) _____	6
Factory Sample Settings Page _____	7
Personal Sample Settings Page _____	8
TUBE MAINTENANCE:	
Tube Noise & Microphonics _____	9
Diagnosing Power Tube Failure _____	9
Tube Noise _____	9
Diagnosing Pre-Amp Tube Problems _____	10
Bias Adjustment _____	11,12,13
Parts Sheet _____	14

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

Do not expose amplifier to moisture, rain or water, direct sunlight or extremely high temperatures.

Always insure that amplifier is properly grounded.

Always unplug A.C. 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 around amplifier.

Keep amplifier away from children.

Be sure to connect to an A.C. power supply that meets the power supply specifications listed on the rear panel of the unit.

If there is any danger of lighting 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 buttons, switches and controls.

Remove the power plug from the A.C. 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 exterior with soft cloth.

Be sure to have the warranty card for this product filled out by the store at which it was purchased and return to Mesa Engineering promptly.

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

No user serviceable parts inside. Refer service to qualified personnel.

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.**

# BLUE ANGEL

## Operating Instructions

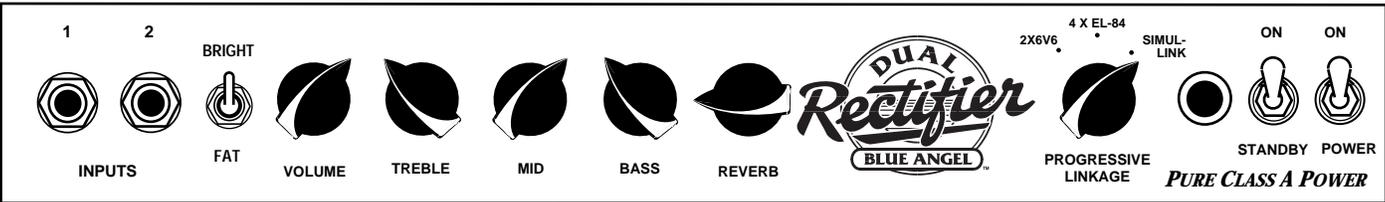
**OVERVIEW:** The BLUE ANGEL is a sophisticated and extremely versatile single channel amplifier that focuses on the lower to medium gain requirements of today's blues and roots music. The simple control layout pays tribute to the classics of yesteryear, while the addition of a new concept in power design, PROGRESSIVE LINKAGE, elevates the BLUE ANGEL to a class all its own. Power section clippability at its expressive best in three distinct styles and volume levels! And just to ensure the tonal purity of the ten tubes hard at work, a tube rectifier stands guard protecting the ANGELS' vintage nature at all times.

The BLUE ANGELS' pre-amp, though simple, is also a highly tuned instrument capable of extremely fine increments of gain. This preserves an individual guitar's inherent tone and keeps it intact. A BRIGHT/FAT switch was included to enhance both single coil and humbucking pick-ups and match them to the selected power tube choice.

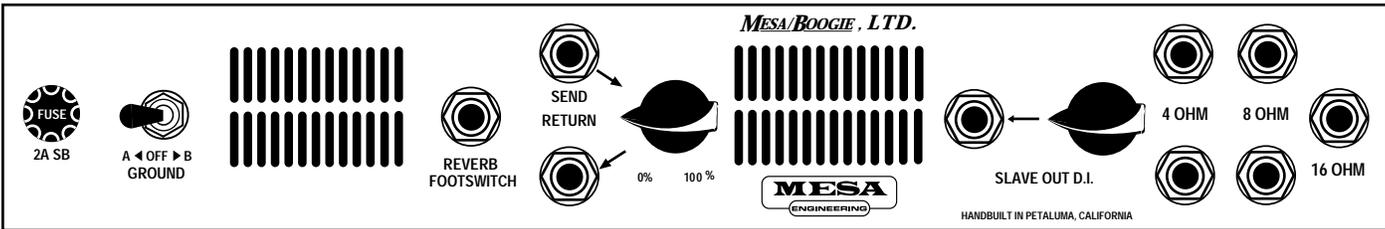
Looking to the Rear Panel assures that all your interfacing needs are covered. A parallel effects loop with a MIX control provides tone insurance for even those questionable effects. To use the BLUE ANGEL in larger rack systems, or, to interface with other power sections, the SLAVE jack and its' LEVEL control is a welcome feature. Three speaker jack combinations are provided (two 8 ohm, two 4 ohm and one 16 ohm) to ensure the proper impedance match to many types of speaker enclosures. The REVERB can also be footswitched in or out of the circuit.

As you can see, the BLUE ANGEL provides all the features any demanding pro could need and at the same time remains simple to operate.

### FRONT VIEW: BLUE ANGEL

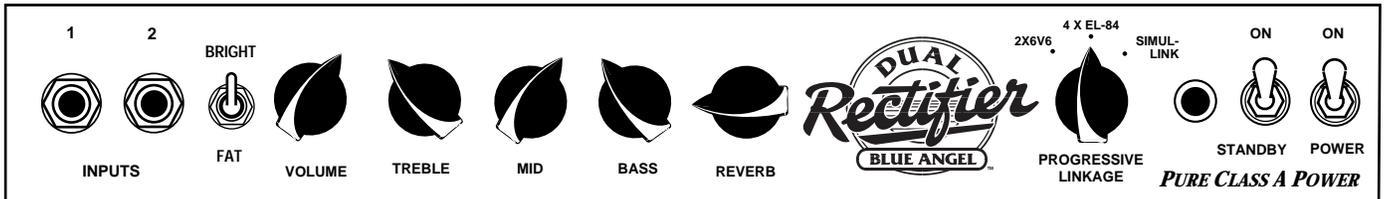


### REAR VIEW: BLUE ANGEL



## FRONT PANEL:

**POWER-UP:** Connect your favorite guitar to the instrument input jack. Flip the power switch “ON” while leaving the STANDBY switch set to “STANDBY”. (It’s always a good idea to practice this start up procedure) as at least 30 seconds of warm-up time lessens the shock on cold power tubes, thus prolonging their life substantially. Next - set the controls per the example below:

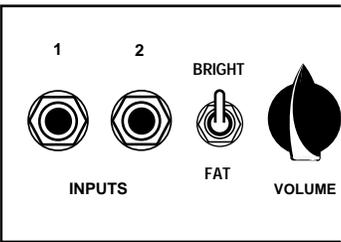


**INPUTS:** The BLUE ANGEL provides two instrument inputs identified as INPUTS 1 and 2. The “normal” input to use in most cases would be INPUT 1. INPUT 2 may be used to obtain a “cleaner” sound as it has a sensitivity pad built into it. This pad also slightly alters the higher frequencies making them a bit breathier and hollow. Experiment with INPUT 2 as you may find it’s effect to your liking.

Flip the STANDBY switch to the ON position and while listening to the BLUE ANGEL, rotate the PROGRESSIVE LINKAGE switch to dial up some of the sweetest blues sounds you’ve ever heard. As always, experimentation leads to finding many different sounds and understanding the controls along with the way they interact, can make this much easier and more fun. Now lets get specific!

## CONTROLS:

**VOLUME: (Gain)** This is by far the most powerful control in the amp. It not only determines the overall Volume amount, shape and sensitivity of the amp...but it is also a powerful Tone control. Generally speaking, whatever is dialed here ultimately determines the ANGEL’S personality. Set low, it allows cleaner, brighter sounds with enhanced dynamic response, especially in the higher frequencies. Set high the whole personality of the amp becomes darker, fatter and more overdriven. In the BLUE ANGEL we worked hard to make sure the entire range of Volume available is usable and more importantly, musical. Don’t think for a moment that this simple one knob layout limits you as to the amount and texture of Volume. Long neurotic hours were spent to ensure the ranges of Volume were stylistically accurate.

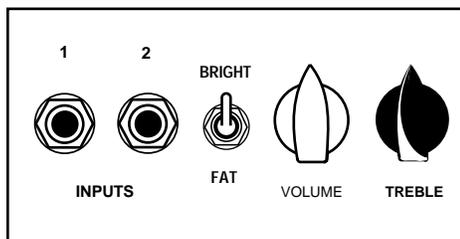


This would be a good time to mention that most of the great sounds can be found by setting the VOLUME control moderately. Use of moderation here will reduce the likelihood of pesky tube microphonic problems ever occurring.

## CONTROLS: (Continued)

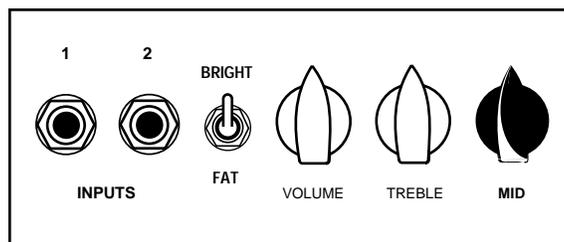
### TREBLE:

As with most guitar amplifiers, the TREBLE control is the strongest of the three rotary tone controls. Its setting on the BLUE ANGEL determines the blend and strength of the MIDDLE and BASS controls. Set high, it is the dominant control minimizing the amount of MID and BASS that would be possible in the mix. Set low, the TREBLE becomes the recessive control and a warmer, darker blend is produced. Dial with care. Subtle tweaking of this control tends to produce the best results.



### MIDRANGE:

Through endless daily tone dreaming, the “if-only” design dictum led to the dial-in-gain boost. In the BLUE ANGEL an over the top crunch sound was made possible by the inclusion of the dual purpose MID control. From  to about  the taper is adjusted to act as a very effective MID control. As you increase the MID to  and above, you will hear the lower Mids getting more pronounced and fatter. At about , the MID leaves behind the notion of being a tone control and becomes a truly usable gain control. The MID controls upper range  is a smokin’ addition to the VOLUME control for all kinds of higher gain sounds. Try the MID set high and the VOLUME control at  –  for a cool blues solo sound. If this still isn’t crazy enough for you...Max the VOLUME and TREBLE controls and plug into a 4x12 with some Celestion Vintage 30’s or 25’s. This should be sufficiently grinding for all you crunch fiends. As you can see, the

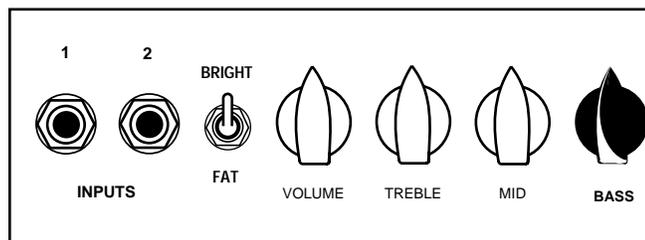


versatility that this dual purpose MID control lends to the BLUE ANGEL greatly expands the amplifiers’ clean and overdrive capabilities.

NOTE: The lower region of the MID control determines midrange punch and boldness in lower gain sounds and a smooth vocal blend in high gain sounds. It can be very effective acting as a “cut through the band control” in certain situations. Dial to taste, remembering that the setting of the TREBLE control greatly effects this controls strength.

### BASS:

This control blends in the lower frequencies and its effectiveness, again, depends on the setting of the TREBLE control. It should be set with moderation as extreme settings in either low or high directions can produce an unbalanced tone. Be “especially” careful in higher Volume settings, for too much BASS will cause a flabby unfocused sound that can’t be dialed out because excessive Bass has been introduced to the pre-amp in the early stages.



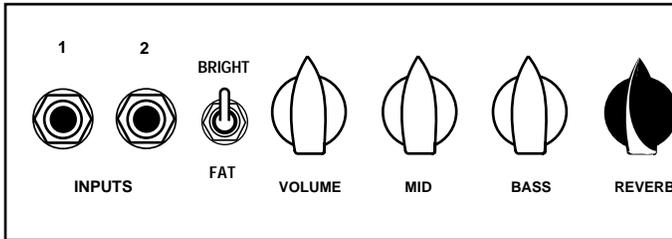
 – . These settings will vary with the amount of Volume and Treble that you have dialed up.

NOTE: When using the ANGELS’ BRIGHT / FAT switch in the up position (BRIGHT), try setting the BASS to  – . When using the switch in the opposite direction try a setting of

## CONTROLS: (Continued)

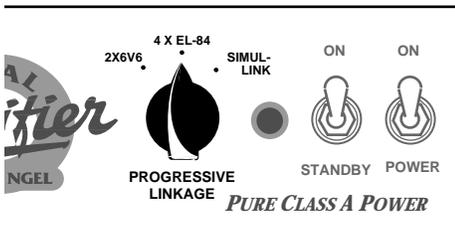
### REVERB:

With the BLUE ANGELS' REVERB control, different amounts of the rich ALL TUBE REVERB can be mixed with the dry signal. It is normal for extreme settings of the REVERB control to slightly alter the sound character of the amplifier as the voicing of the REVERB circuit becomes more dominant in the mix. This normal, slight alteration, is a result of listening to the REVERB return stage high in the mix and no cause for alarm.

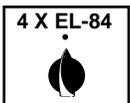


What...? No, not a carburetor, PROGRESSIVE LINKAGE is a breakthrough concept in power section design. This unique circuit utilizes different types of power tubes for different power ranges and styles - enabling you to select between them or combine them for the ultimate in pushed power expression. With PROGRESSIVE LINKAGE your BLUE ANGEL is like having three power amps built into one portable chassis. Three selections are available: 2X6V6s, 4XEL84, and Simul-Link. When both styles of tubes are used simultaneously via Simul-Link, a unique voice is produced that only PROGRESSIVE LINKAGE can deliver.

### PROGRESSIVE LINKAGE:



This position produces roughly 18 watts of "Retro" style Class A power. This pair of tubes lends a sweet bubbly nature to the sound and delivers a large breathy bottom end characteristic. They clip fairly early, break up smoothly and stay rich and warm.



This position uses a quartet of these classic tubes to produce it's 33 watts of bright, aggressive power. These tubes fueled the guitar music of Britain for decades as the workhorse power tube. The sparkling highs and lush harmonic content that these tubes deliver, have become essential components - highly sought after - of many amp builders, players and producers of today. The BLUE ANGEL offers these beauties running Class A and biased just right to produce the sweetest clean sound when played soft and yet the elusive "lined up" harmonics when pushed to clip. The EL84 setting retains the tightest bottom end and blend when high Volume settings are used; thus becoming the likely candidate for rock or crunch style sounds.

And now for the real treat! These two classic and undeniably favorite power tubes, great as they are, can have their drawbacks. When pushed too far into clip, 6V6s tend to get flubby and indistinct. EL84s conversely, can be thin at times, lacking bass and warmth when they are tortured. This circuit uses all six power tubes and produces a bouncy rich 38 watts of PURE CLASS A POWER. It is the patented magic of Simul-Link that sets the ANGELS' power section in a class all its' own. Of the three possible positions, Simul-Link offers the highest power when connected to an eight ohm load (1X12 combo or 2X12). PROGRESSIVE LINKAGE offers a unique alternative and ushers in a new era of usably clippable power.



Combining these two occasionally ill-behaved power tubes by clicking into Simul-Link, allows each tube's quirks to become an asset when used in tandem. The EL84s and tightness and attack to the looser 6V6. In return, the 6V6's better Bass response warms up the EL84s, giving them breathiness and a more resilient feel. This combination of tube types produces the most controllable power section clip we've discovered to date.

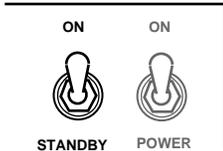
NOTE: It is preferable to use the 4 ohm speaker jack when the PROGRESSIVE LINKAGE switch is set to the 6V6 position. This will reduce strain on the tubes thus prolonging their life as well as improving the response over a wide range of frequencies. It is not mandatory...merely a suggestion, as the impedance loading is correct when this scheme is followed. This suggested match up between tubes and speaker impedance will also produce the greatest amount of headroom and the most well balanced tone.

## TOGGLE SWITCHES

### ON / STANDBY:

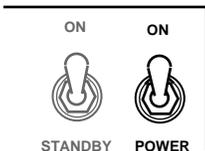
toneful life substantially.

Perfect for set breaks... this toggle switch also serves an even more important purpose. In the STANDBY position the tubes are at idle so that during power up they may warm up before being put to use. Before Power is switched on make sure the STANDBY switch is in the STANDBY position. Wait at least 30 seconds and then flip the STANDBY to the "ON" position. This prevents tube problems and increases their



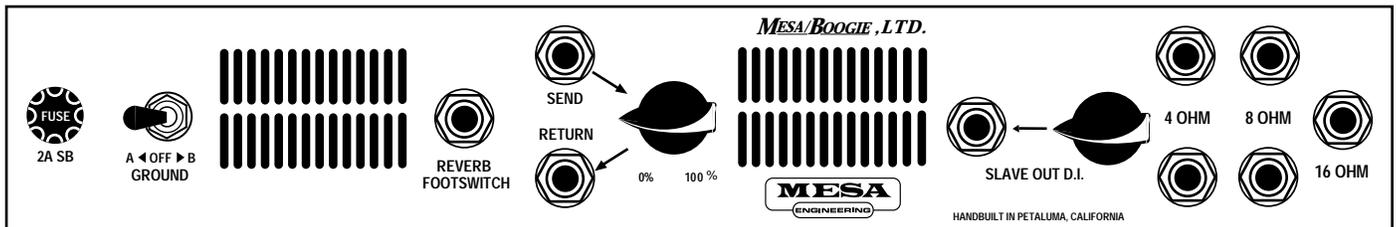
This switch delivers the A.C. POWER to the BLUE ANGEL. Make sure the unit is grounded (all three terminals of the A.C. POWER cord must be connected whenever possible to avoid injury to the user as well as to the unit) and that the proper voltage is present. Follow the cold start procedure described in the ON / STANDBY section above when powering up your BLUE ANGEL.

### POWER:

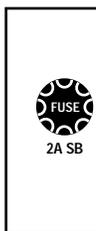


This is the A.C.'s (Alternating Current) main FUSE and provides electrical current protection from outside

## REAR PANEL:



### FUSE:



A.C. fluctuations, as well as power tube failure damage. Should the FUSE blow, replace it with the same rating in a slo-blo type package. The domestic U.S. version requires a 2 amp slo-blo FUSE. A power tube short or failure is often the cause of a blown FUSE... Follow the cold start procedure mentioned in the ON/STANDBY switch section and watch the power tubes as you turn the STANDBY switch to the ON position. If a power tube is going bad or is arcing you will see it! Flip the STANDBY switch to STANDBY immediately and replace the faulty power tube and the FUSE if necessary. If you see nothing abnormal as you lift the STANDBY switch, it is possible that a power tube shorted temporarily and blew the FUSE. If this is the case it may work again normally. To be extra safe you may want to replace all power tubes in the "shotgun" troubleshooting tradition and save the replaced set as spares.

NOTE: Like tires on a car, spare tubes are always a measure of good insurance. Your BLUE ANGEL was carefully constructed with reliability in mind! Given the proper care and maintenance, it will deliver years of trouble free service. Spare tubes and fuses are a must for the fabled cord bag and may someday be worth their weight in gold.

This switch reverses the polarity of the A.C. GROUND. It can be helpful in eliminating annoying hum or A.C. buzz as well as those painful microphone shocks. It should be left in the center "OFF" position when neither of these problems are occurring.

### GROUND:



This 1/4" jack allows you control of the REVERB remotely when a cable and Mesa Footswitch are connected. The REVERB FOOTSWITCH is an option and can be ordered by calling us direct or by contacting

## REAR PANEL: (Continued)

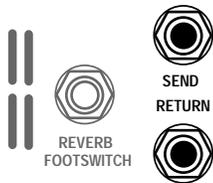
### REVERB FOOTSWITCH:

your nearest Mesa/ Boogie Pro Center.



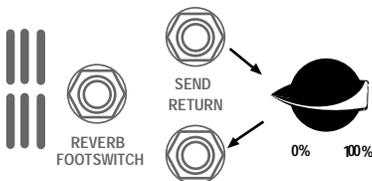
This 1/4" jack allows you control of the REVERB remotely when a cable and Mesa Footswitch are connected. This footswitch is an option and can be ordered by calling us direct or by contacting your nearest Mesa/Boogie Pro Center.

### FX LOOP: SEND & RETURN



These two 1/4" jacks are the patch point for external effects. The EFFECTS LOOP is wired in parallel with the normal signal. Connect the SEND jack to your Effects Input jack. Connect the RETURN jack to the Output jack of your effect. The EFFECTS LOOP is a patch point between the pre-amp and power section. Therefore, the RETURN jack can double as a Power Amp Input jack.

### FX MIX:

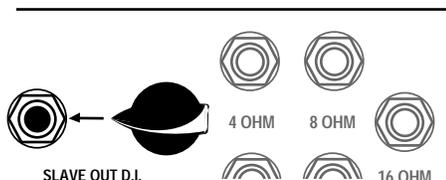


This control determines the dry/wet blend of the FX Loop signal in relation to the unaffected signal. Set to 0% you will experience only the dry signal (no effect) and at a setting of 100% the entire signal will be wet (total effect.)

For the best results...Set the mix of your effect to 100% wet. Then dial in the amount of effect that you wish to hear, starting at 0% with the FX LOOP MIX control. The drier (closer to 0%) signal you use, the better the ANGELS' tone should be. This is one of the advantages in having a parallel type FX LOOP designed into your BLUE ANGEL amplifier...this

circuit allows the amplifier to retain its purity with the least possible degradation due to effects impedance mismatching.

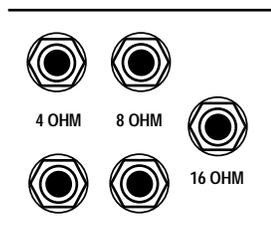
### SLAVE D.I.:



This 1/4" jack and control provide a signal derived from the speaker jack. Perfect for using the BLUE ANGEL as a master pre-amp, or additional power amps may be connected for more power when needed. Some players use this to derive an FX Send Signal and go to other amps for their wet sound.

NOTE: Once a signal is taken from the SLAVE, it can not be inserted back into the FX Loop Return jack or a feedback loop will occur. Much like holding a microphone into the PA system's cabinets...a loud high pitched squeal will occur.

### SPEAKERS:



Two 8 ohm, two 4 ohm and one 16 ohm speaker jacks are provided. The BLUE ANGEL is not very sensitive to speaker mismatches and will not be damaged by them, except that very low ohmage loads will cause the power tubes to wear faster. A single twelve-inch 8 ohm speaker should generally be connected to the 8 ohm output. When using two 8 ohm speakers, connect them to the 4 ohm jacks to insure proper impedance matching. Mesa/Boogie 4X12 and 4X10 cabinets come standard wired to 8 ohms. They have four 8 ohm speakers wired in series-parallel. Some cabinets other than Mesa/Boogie, may be 4, 8 or 16 ohms; To confirm how your cabinet may be wired and the impedance rating of your speakers, you may need to remove the back panel to verify this information in regards to proper speaker matching.

Feel free to experiment with the speaker jacks, trying different loads. Keep in mind the greatest clean headroom is always achieved

# SUGGESTED SAMPLE SETTINGS

## SAMPLE 1 *Sparkling Clean*

*Most Pickups*

1 2 BRIGHT FAT VOLUME TREBLE MID BASS REVERB

**DUAL Rectifier BLUE ANGEL**

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE STANDBY POWER

*PURE CLASS A POWER*

## SAMPLE 2 *Pushed Bluesy Rhythm/Solo*

*Neck Single Coil*

1 2 BRIGHT FAT VOLUME TREBLE MID BASS REVERB

**DUAL Rectifier BLUE ANGEL**

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE STANDBY POWER

*PURE CLASS A POWER*

## SAMPLE 3 *Blues Lead* (Bright / Fat switch either way)

*Neck Single Coil*

1 2 BRIGHT FAT VOLUME TREBLE MID BASS REVERB

**DUAL Rectifier BLUE ANGEL**

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE STANDBY POWER

*PURE CLASS A POWER*

## SAMPLE 4 *High Gain Lead/Crunch*

*Rear Humbucking*

1 2 BRIGHT FAT VOLUME TREBLE MID BASS REVERB

**DUAL Rectifier BLUE ANGEL**

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE STANDBY POWER

*PURE CLASS A POWER*

## SAMPLE 5 *Old Time Lead*

*Single Coils*

1 2 BRIGHT FAT VOLUME TREBLE MID BASS REVERB

**DUAL Rectifier BLUE ANGEL**

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE STANDBY POWER

*PURE CLASS A POWER*

# PERSONAL SETTINGS PAGE

1 2 BRIGHT

INPUTS FAT VOLUME TREBLE MID BASS REVERB

DUAL Rectifier BLUE ANGEL

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE

STANDBY ON POWER ON

PURE CLASS A POWER

1 2 BRIGHT

INPUTS FAT VOLUME TREBLE MID BASS REVERB

DUAL Rectifier BLUE ANGEL

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE

STANDBY ON POWER ON

PURE CLASS A POWER

1 2 BRIGHT

INPUTS FAT VOLUME TREBLE MID BASS REVERB

DUAL Rectifier BLUE ANGEL

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE

STANDBY ON POWER ON

PURE CLASS A POWER

1 2 BRIGHT

INPUTS FAT VOLUME TREBLE MID BASS REVERB

DUAL Rectifier BLUE ANGEL

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE

STANDBY ON POWER ON

PURE CLASS A POWER

1 2 BRIGHT

INPUTS FAT VOLUME TREBLE MID BASS REVERB

DUAL Rectifier BLUE ANGEL

2 X 6V6 4 X EL-84 SIMUL-LINK

PROGRESSIVE LINKAGE

STANDBY ON POWER ON

PURE CLASS A POWER

with proper impedance loads...i.e. an 8 ohm speaker connected to an 8 ohm jack. Always insure that a speaker load of some kind is connected when using the amplifier.

**TUBE NOISE & MICROPHONICS:** You may occasionally experience some form of tube noise or microphonics. Certainly no cause for alarm, this quirky behavior comes with the territory and the Tone. Much like changing a light bulb, you don't need a technician to cure these types of minor user serviceable annoyances and in fact, you'll be amazed at how easy it is to cure tube problems...by simply swapping out a pre-amp or power tube!

First may we suggest that you set the amplifier up on something so that you can get to the tubes comfortably without having to bend down. It also helps to have adequate lighting as you will need to see the tube sockets clearly to swap tubes. Use caution and common sense when touching the tubes after the amplifier has been on as they may be extremely hot! If they are hot and you don't want to wait for them to cool off, try grasping them with a rag and also note that the glass down around the bulbous silvery tip is considerably less hot which makes it easier to handle. Gently rock the tube back and forth as you pull it away from its socket.

**DIAGNOSING POWER 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 and shorts can either be mild or severe. In a mildly shorted tube the electron flow has overcome the control 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 two of a pair 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 often 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 ON 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.

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. By this time the fuse probably will have blown. 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. Replace it and the fuse with the proper slo-blo type and power up the amp using the power up procedure as we described earlier in this manual.

**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 BLUE ANGEL on Standby, remove it from its socket and turn it back on. It will cause no damage to run the BLUE ANGEL 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 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 a new one just to be sure of your diagnoses. You will be doing yourself and us a big favor by just following the simple guidelines previously mentioned regarding tube replacement. 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 that we can send you the appropriate match.

**DIAGNOSING PRE-AMP TUBE PROBLEMS:** Because your amplifier is an all tube design, it is quite possible that you will at some point experience minor pre-amp tube noise. Rest assured - this is no cause for alarm and you can take care of the problem yourself in a matter of minutes by simply swapping tubes.

Let us begin by saying; It is a "very good" idea to keep at least a couple of spare pre-amp tubes on hand at all times to insure uninterrupted performance. These minor pre-amp tube problems can take many forms but can generally be described in two categories: Noise and Microphonics. Noise can be in the form of crackling, sputtering, white noise/hiss and/or hum. Microphonic problems usually appear in the form of a ringing or high pitched squealing that gets worse as the gain or volume is increased thus are more noticeable in the higher gain "HI" modes. Microphonic problems are easily identified because the problem is still present even with the instruments' volume off or unplugged altogether - unlike pick-up feedback which ceases as the instrument is turned down. Microphonic noise is caused by mechanical vibration and shock: think of banging a microphone around and you'll understand where the word came from.

If you cannot narrow down the trouble to a specific mode or channel, the problem may be the small tube that drives the power tubes which is operational in all modes and channels. Though rare, a problem with the driver tube would show up in all aspects of performance - so if you can't narrow the problem down to being mode or channel specific, you may want to try replacing the driver tube. Driver problems generally show themselves in the form of crackling or hum in all modes of performance and/or weak overall output from the amplifier. Occasionally an anemic driver tube will cause the amplifier to sound flat and lifeless, but this is somewhat uncommon, as worn power tubes are a more likely suspect for this type of problem.

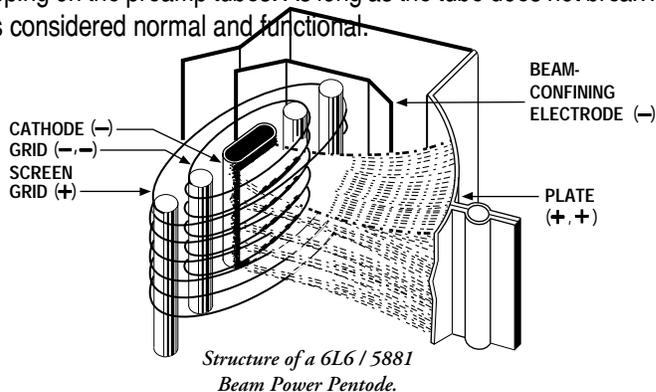
Sometimes making the diagnosis is more trouble than it's worth and it's faster and easier to merely replace the small pre-amp tubes **ONE AT A TIME** with a replacement known to be good. But **MAKE SURE** you keep returning the tubes to their original socket until you hit the one that cures the problem. You'll notice that tubes located nearer to the INPUT jack always sound noisier...but this is because they are at the start of the chain and their noise gets amplified over and over by the tubes that follow. The tube that goes into this "input socket" (usually labeled V1) needs to be the least noisy of the bunch. The tube that goes at the end of the preamp chain - just ahead of the power tubes - can be quite noisy without causing any problem at all. The tubes in your amp have already been located in the most appropriate sockets and this is why you should **NEVER** pull them all out at once and **ALWAYS** swap them one at a time. **ALWAYS** return a perfectly good tube to its original socket. Also it's a good idea to put the amp on **STANDBY** when swapping tubes to reduce the heat build up in the tubes themselves and to prevent explosive noises (which can still occur even if you are pulling the tubes away from their sockets gently) from coming through the speaker.

Remember, take your time, be patient and chances are real good that you can fix your amp yourself by finding and replacing the bad tube. It kills us to see someone who has shipped their amp back to us...and all it needed was a simple tube replacement!

If you must send back your amp, unplug the power cord, speaker and reverb cables then remove the chassis from the cabinet by unscrewing the four mounting bolts on top. The chassis then slides back like a drawer and comes out. Remove the big power tubes and mark them according to their location from left to right 1, 2 etc. They need to be wrapped separately with plenty of wadded up newspaper around them and put in a smaller box within the larger carton. To wrap the chassis, use plenty of tightly wadded up newspaper so there is at least six inches of "crush space" between the chassis and the cardboard box. Bubble wrap also works well, but please **DON'T** use styrene peanuts - they will shift during transit and get lodged inside your electronics as well as allowing your amp to end up at the bottom of the box unprotected and possibly damaged.

Pre-amp tubes don't normally wear out as a rule. Therefore, it is not a good idea to change them just for the sake of changing them. If there isn't a problem - don't fix it. If there is no result from your substitutions, it may be possible that you have more than one problematic tube. Though rare, this does happen and though it makes the troubleshooting process a little more intimidating, it is still possible to cure the problem yourself.

NOTE: It is normal to hear a slight metallic ringing sound when tapping on the preamp tubes. As long as the tube does not break into oscillation or start crackling or any other form of bizzare noise, it is considered normal and functional.  
BIAS ADJUSTMENT: (Part of a continuous series)



Here's a question we often hear:

"Why doesn't Mesa put bias adjustments in their amplifiers?"

Well, there's a short answer and a long answer to this question.

The short answer is that during my 12 years of repairing Fenders, one of the most frequent problems I saw was bias controls that were either set wrong or that had wandered out of adjustment due to vibration. As any honest tech will tell you, there's lot's of easy money to be made by sprinkling "holy water" on amplifiers ... uh, what I meant to say is "Your amp needed biasing." See what I mean? What customer is going to argue with that?

It only takes a moment and a volt meter: The Fender diagram shows how: "Adjust this trim pot for - 52 volts." That's it. Nothing more.

Now don't be fooled into thinking that tubes "draw" more or less bias, they don't. The way a bias supply is connected to a tube is akin to a dead end road, it just trails off to nowhere without really completing a circuit. It's a static voltage and regardless of what tube is in the socket — or even if the tubes aren't plugged in at all, it doesn't change the bias voltage a bit.

So the end of the short answer is this: Since a bias supply needs to put out the right voltage and never vary, I wanted to build amplifiers that were individually hard wired to the correct values and NEVER needed adjustment. And for 25 years, that's how Mesa/Boogies have been built.

Time to change tubes? Just plug our tubes into any one of our amps and you're DONE. No tech needed. NO bills and no BS about biasing. And most important: The bias is RIGHT because it can't change!

Now, you want the long answer? Here's more information on how our hard-wired bias avoids trouble. Please read on.

But first, let's make an important distinction. Our business is designing and building high performance amplifiers. And for this we need tubes whose variance is within a narrow range. Our warehouse is full of rejects ...oh, they work — they just don't perform within our tolerance range. We have a very sophisticated computer - based tube testing system (nicknamed "Robotube") that matches and measures tubes over seven important parameters. It can even predict which tubes are likely to have a shortened lifetime — even though they work perfectly during the test.

Because our business is building quality amps, we can afford to reject a lot of wayward tubes. The guys you hear complaining because Boogies don't have bias adjusters are primarily in the business of selling tubes - not amps. They don't want to throw away 30 percent of their inventory, so they promote the idea that tubes outside our parameters can be used to "customize" amplifiers and they criticize us because our amps can't be adjusted to accommodate their out-of-Mesa tolerance tubes.

Now you might be thinking, "But I thought you just said that tubes don't "draw" bias, therefore they don't effect the bias supply and thus it doesn't need to be adjustable."

And that's right. Tubes don't effect the bias setting, but how it effects the tubes is difficult to measure.

When you set the bias (whether it's by selecting the right resistors, as we do, or adjusting a trimmer — which is quicker) what you are BIAS ADJUSTMENT: (Continued) doing is establishing the correct amount of idle CURRENT that flows through the power tubes. But you can't adjust the current directly, you can only change it by adjusting the amount of bias VOLTAGE that goes onto the tubes' control grids.

Voltage and current are NOT the same. Current is the AMOUNT of electricity, the "quantity" — and is measured in amperes. Voltage is the degree of electric charge — like the "pressure" to use the old water analogy. Let me illustrate how different voltage and current are:

When you scrape your feet across a carpeted floor in dry, wintery conditions, your body can become charged with 50,000 to 100,000 volts of static electricity. And when you reach for the door knob, a spark jumps and you feel it! The voltage is super high but the current (measured in micro-amps) is tiny - otherwise you would die from electrocution.

Contrast this with your car battery, which puts out a mere 12 volts. You can lay your hands right across the terminals and not feel a thing. Yet the amount of current available can run to several hundred amperes .. enough to turn over a cold engine and get it started.

So current and voltage are two totally separate electrical parameters — though when you multiply them together, you get POWER, which is measured in watts.

When you set the bias of an amplifier, you are adjusting the static VOLTAGE at the control grid of the tube in order to produce a desired amount of idle CURRENT flowing to the tube's plate. A small change in grid voltage, produces a large change in the amount of current flowing — and that's basically how a tube works. Say that again because it's super important: A small change in voltage at the grid causes a large change in current flowing to the plate. See, that's the essence of amplification: A small change causing a large change. And here it's a small voltage change causing a large current change.

The bias conditions are what determines how much current flows through the big power tubes when you're not playing. And what drives your speakers is fluctuations in that current flow when ARE playing. If the amount of current increases and decreases 440 times per second, then you'll hear an A note. If the fluctuations in current flow are large and still at 440 per second, you'll hear an A that is LOUD!

But for purposes of biasing, it's the amount of "plate current" flowing with no signal applied that's important. Unfortunately current is hard to measure because the circuit must be interrupted — as in "cut the wire" — and the meter spliced "in series" with the broken circuit. But measuring VOLTAGE is easy. It is not necessary to interrupt the circuit because a voltage reading can be taken in PARALLEL with the circuit intact.

Thus, as a matter of convenience, most bias settings are given in volts at the grid ... even though current through the plate is the important factor. In fact plate current is so inconvenient (and dangerous) to measure that Fender doesn't even state what the correct value should be. They only give the grid voltage that will produce that current. (That's the minus 52.) But that only happens if the tubes being used are "in spec."

As long as the tubes ARE "in spec", the right bias voltage will always give the correct plate "CURRENT" — but then there's no need for the bias voltage to be adjustable!

If the tubes are NOT in spec, then the only proper way to re-set the bias is to cut the circuit and measure the current while adjusting the bias ... but no manufacturer I know even STATES the desired current value! Be that as it may, when the original bias voltage is altered far enough, it will compensate for the tube's abnormal performance and the correct amount of idle current flow may then be restored. Clearly this is something most repair techs should not attempt.

Some newer amps have LED indicators connected to the circuit which will turn on when the right threshold of current flow has been reached. This is an improvement, and almost worthy if you're willing to except resistors and lights added into your amplifier's audio path — which we aren't. The other "advantage" of this system is that it allows some amp manufacturers to avoid matching their power tubes. The thinking is that adjusting the bias to each tube separately eradicates the inherent differences between the tubes by

insuring that the same current flows through each one.

Again, this has some merit .. but it's still not as good as using tubes that are matched in the first place because compensating for the mis-match causes the push-pull circuit itself to become unbalanced. Two wrongs don't really make a right.

Some of the other recommended biasing, "methods" — such as -". tubes running red hot, increase the bias .. sounds harsh and runs too cool, turn it down ..." are guesswork at best. Luckily, one of the great things about tube amps is that they can usually stand some abuse without causing any real harm ... at least not immediately.

But don't these alterations imply that you are second-guessing the amp designer and that there's a better set of operating conditions that the designer missed but the tube sellers have discovered?

Now some players may like the sound of their amp altered by tubes with extreme characteristics and with the bias set to help compensate. But often it is the mere novelty of change that they're really responding to and when the amp goes back to the proper original way, we've seen them be far happier still!

Because every part in every one of our designs has been meticulously evaluated, compared and stressed over — no matter how seemingly insignificant it might be. And with every design we look for a "sweet spot" where all the parameters — including the bias — come together to give the best sonic performance, consistently and reliably. Every part and voltage is important — yet no one complains that these other parameters aren't available for tinkering.

Consider our patented Simul-Class circuitry where there are two different bias voltages used for separate pairs of power tubes ... and changing one voltage also changes the other. Great care goes into getting this just right and we think we'd be asking for trouble to have it adjustable for the world to play with ... unless you like paying to have your amp messed up. Sorry, I meant to say, "Uh, ... your amp needed biasing."

If that doesn't appeal to you, then merely plug a matched set of Mesa tubes into one of our amps and you're ready for tone. Guaranteed. You'd be amazed at the number of service calls we field every day that lead to a diagnosis of out-of-tolerance, non-spec tube problems. To think these would be prevented by including a bias adjustment is something of an insult to you and us. If you put the wrong size tires on your car, do you think changing the pressure will make them right?

Please, don't think this is a blanket indictment of the other guys selling tubes — it isn't. And their tubes aren't all bad either. It just doesn't make sense to pay more of your hard earned cash for tubes that were probably made in the same Russian or Chinese factory and which have the possibility of being outside the performance window we select for your amp. And it pains us to hear the hype and mystique built up around biasing when twenty-five years of evidence affirms our decision to make bias circuits that "never need adjustment". How much money and trouble that has saved Mesa/Boogie players you couldn't estimate.

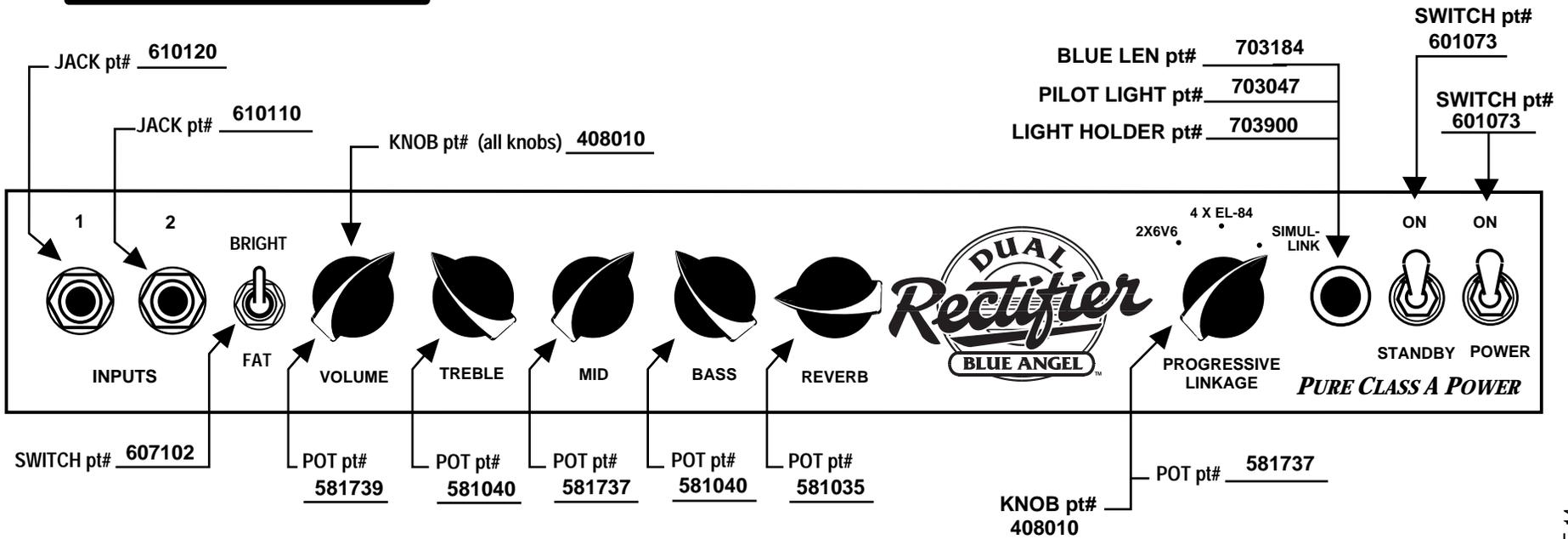
Our rigorously tested and hand selected tubes are available at your nearest Mesa/Boogie Pro Center or from us directly. Nobody offers better price, quality or warranty than we do ... so why swerve?

Next time we'll talk about our part in developing the great Sylvania STR 415 type 6 6 and how we're on the verge of seeing something fairly close reappear on the market. Remember, we still have some of these super rugged mondo-bottles available for older amps — Boogies only please! Until then, Relax, Breathe and Nourish your soul!

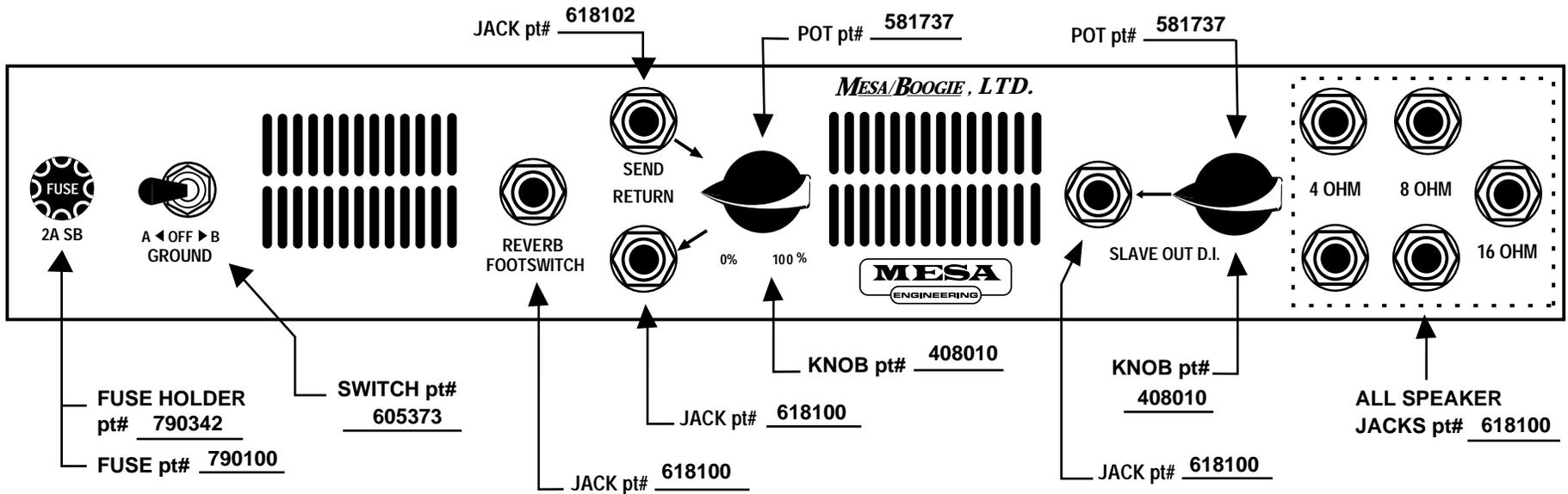
Cheers!  
Mesa/Boogie Ltd.

Randall Smith  
Designer & President

**FRONT VIEW BLUE ANGEL**



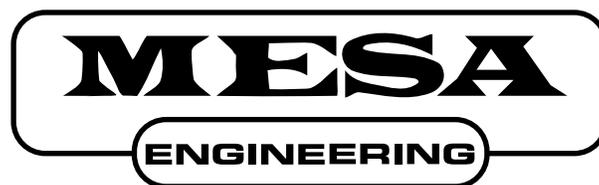
**REAR VIEW BLUE ANGEL**



# ***MESA/BOOGIE***

***The Spirit of Art in Technology***

***Thank you*** for trusting MESA/Boogie to be your amplifier company. We wish you many years of toneful enjoyment from this handbuilt all tube instrument.



*The Spirit of Art in Technology*



*1317 Ross Street Petaluma, CA 94954  
USA*