VAC VINTAGE HIGH POWER Mk II
MONOPHONIC POWER AMPLIFIER

Operating Instructions

DO NOT OPEN THIS UNIT - THERE ARE NO USER SERVICEABLE PARTS INSIDE. DO NOT REMOVE THE BOTTOM PLATES. LETHAL VOLTAGES ARE PRESENT WITHIN THE CHASSIS. DO NOT EXPOSE THIS UNIT TO MOISTURE OR OPERATE IT IF WET.

VACUUM TUBES BECOME HOT ENOUGH TO CAUSE SERIOUS BURNS. NEVER TOUCH A TUBE WHEN THE UNIT IS ON. IT MAY TAKE SEVERAL MINUTES FOR THE TUBES TO COOL DOWN AFTER THE UNIT IS SWITCHED OFF.

DO NOT PLUG INTO AN AC SOURCE UNTIL ALL CONNECTIONS ARE COMPLETED.

Introduction

The Vintage High Power is a wideband low-feedback monoblock power amplifier producing approximately 100 watts per chassis. It is largely based on the legendary Williamson circuit, which was first published in England in 1947, and was the mainstay of the original high fidelity movement. Notable features of this circuit include:

- direct-coupled triode input amplifier and phase splitter, resulting in low phase shift
- inherent precise balance of the phase splitter (if properly executed) at all frequencies and level, resulting in excellent push-pull balance and low distortion

In the refined form presented in the VAC, this circuit delivers true state-of-the-art performance, and repudiates the more complex designs seen even to this day. The output stage features *independent cathode bias* for each tube, which results in excellent sound and the most stable and maintenance free operation available anywhere.

Premium parts are employed throughout, including 14 pound 22 section bifilar-wound ultra-wideband output transformers, polypropylene and polystyrene signal capacitors, high current rectifiers, low ESR power supply, and proprietary wiring. The quality of parts and careful layout allows the use of very little feedback for high sonic purity and low distortion.

Unpacking

Each tube socket on the amplifier is covered by a small round sticker. The color of this sticker corresponds to the color of the sticker on a tube. Fit each tube into the matching socket, first *removing* the sticker from the tube and socket. The bias levels for the output tubes have been factory set, but should be checked during the installation procedure.

Installation

Physical requirements:

1) Provide adequate ventilation - allow at least 3 inches above and 1 inch to each side.
2) Do not place in a completely enclosed cabinet.
3) Do not stack other equipment on top of the VAC units.
4) Do not operate on carpet or any other surface that might block air flow.
5) The chassis and power transformers will become hot in normal use.
6) Do not allow the chassis of the VAC components to touch any metal parts, such as the frame of an equipment rack. This might create a parallel ground path that will degrade the sound of your system.

Electrical connections:

1) Complete all installation steps before plugging the amplifier into the AC mains supply.
2) Connect signal inputs to the power amplifiers. Single ended interconnect cables equipped with RCA phono plugs provide the input to each channel.
3) Connect loudspeakers between the appropriate pair of binding posts on the back of the power amplifiers. Most popular speaker cables can be accommodated by the output terminal strips. Output impedance matching is available for loads of 2, 4, and 8 ohms. Connect one lead of the speaker cable to the "G" position, and the other to either 2, 4, or 8. The "G" terminal is at ground potential, and the amplifier does not invert phase.
4) Do not connect two amplifier outputs to each other.
5) Connect the AC cord to the power source indicated on the rear panel (100 volts AC, 120 volts AC, 220 volts AC, or 240 volts AC at 50 or 60 Hertz).
6) Follow the BIAS procedure described in this manual to set the idle current. Check the idle current at 1 minute, 30 minutes, 1 hour, and 2 hours. Also, read the section entitled INSTALLING NEW OUTPUT TUBES.

Operation

Continuous operation is not recommended. If the amplifiers will not be auditioned for a few hours it is best to turn them off. This avoids undue stress to the KT88 output tubes.

As with all high fidelity products, the sound characteristics of the VAC amplifiers change somewhat as they warm up. Best sound will be achieved after 15 minutes of operation, with subtle changes occurring for up to one hour. However, we advise against leaving the equipment on at all times because of the attendant acceleration of output tube wear. Life of the output tubes averages between 2,000 and 5,000 hours depending upon brand fitted and random variations within the tubes themselves.

Any time that the VAC Power Amplifier has not been used for a few weeks the sound may be different. This is also normal for high resolution audio equipment. Optimum sound should return after a few hours of operation, preferably with an audio signal.

Please note that although your VAC amplifiers have been run for 48 hours at the factory, they will continue to "break in" for approximately 150 hours. The break in is most pronounced in the ultra-linear mode. Note that the optional triode mode and ultra-linear mode do not require separate break in periods, and that the ultra-linear mode will improve even if you only operate the amplifiers in the triode mode (this is in most cases the most listenable way to break them in).

Also be aware that many components display the need for a new break in period after being transported in unheated cargo aircraft.

Bias Adjustment

Your VAC Power Amplifier has been shipped with output tube bias preset. This should be checked when you install your amplifier, and approximately every month thereafter. It must also be set whenever an output tube is changed.

Monitoring and adjustment of the output tubes is quite easy, and requires a simple voltmeter. To start, place the black test lead in the center test point (TP5) and the red lead in TP1 (the test probes will "snap" into the test point jacks with moderate pressure). Adjust the associated bias control to obtain the DC voltage reading listed on the top of the chassis. Perform the same operation for TP2, TP3, and TP4. Finally, since the tubes interact slightly, repeat this procedure two or three times until the readings are unchanged. Lower bias readings will not damage the amplifier or tubes, but may affect the sound if more than 1 or 2 volts low. It is most important to have all of the tubes read the same within +/- .5 VDC.

When installing *new* tubes, adjust the bias controls to the centers of their rotations. Check the bias of all tubes *as the amplifier warms up* - don't wait ten minutes. Recheck after 10 minutes, one hour, and one week.

Bias levels should be checked monthly to ensure optimum sound quality. *Allow the amplifier to warm up for an hour before checking*. It is not unusual for bias current to change with time, particularly when tubes are new. In fact, the greatest amount of drift occurs during the first 200 hours of a tube's life. The drift may change direction periodically, such that the bias control must be increased and then later decreased, or vice versa. Also check bias if the sound seems to be lacking in detail or dynamics.

Tube Types

The input/splitter tube V1 and the driver tube V2 may be type 12AU7A/ECC82/E82CC or type 12BH7. The output tubes V3, V4, V5, and V6 may be type KT88, KT88 Super, or type 6550A. Golden Dragon tubes are generally recommended and have been used extensively during the development of this amplifier. Please feel free to contact VAC if you require additional information or advice.

Installing New Output Tubes

Replacement tubes are available from VAC and other sources. Output tubes may be KT88 Beam Power Kinkless Tetrodes or 6550A Beam Power Tetrodes. It is not necessary that they be matched pairs, although an improvement in measured performance may be achieved in this way. Make certain that each tube fits firmly in its socket. A tube that fits loosely may not make correct contact on all pins and might "run away" (read on). DO NOT MIX TYPE KT88 AND TYPE 6550A TUBES. DO NOT MIX BRANDS OF TUBES.

ALL POWER MUST BE OFF. Remove the old tubes after they have cooled down (TUBES BECOME HOT ENOUGH TO CAUSE SERIOUS BURNS WHEN IN OPERATION AND MAY TAKE SEVERAL MINUTES TO COOL DOWN). Install the new tubes firmly and fully in the sockets, taking care to observe the direction of the locating ridge on the plastic center pin of each tube.

Follow the normal turn on procedure and begin the BIAS procedure. While doing this, keep an eye on the plate (the outermost metal structure) of the output tubes. SWITCH OFF IMMEDIATELY IF THEY BEGIN TO GLOW RED. This indicates that the tube is "running away", being destroyed rapidly by conducting excessive current. (Note: with some KT88s a slight dull orange glow may occur over a very small section of the plate, usually at an edge. This is acceptable and not the same as running away, in which most of the plate will become bright orange or red.)

Tubes may run away for several reasons:

1) The tube is not fully inserted in the socket.
2) The tube fits loosely in the socket and thus can not make correct contact. Such a tube is unusable and should be returned to its seller.
3) The tube is defective.
4) The bias is misadjusted.
5) There is a problem with the amplifier. Contact VAC or your dealer to arrange service.

In the event that trouble is encountered, try another tube. Stop if the problem persists and consult with your dealer or VAC.

Follow the BIAS procedure described previously in this manual to set the correct idle current for each tube. Recheck the idle current at 1 minute, 30 minutes, 1 hour, and 2 hours.

Replacement of Low Level Tubes

All power must be switched off. Allow tubes to cool down. Remove and replace with new tubes of the appropriate types, noting the location of holes in the socket and pins of the tubes.

Replacement tubes are available from VAC and other sources.

Care of Chassis & Face Plate

VAC chassis are aluminum for superior electromagnetic performance. The standard face plate finish is a durable textured black, which may be cleaned with a slightly damp cloth WHILE THE AMP IS SWITCHED OFF AND UNPLUGGED. The optional highly polished black lacquer can be scratched or chipped, just as that of a fine automobile may be damaged, and should be treated with similar materials WHILE THE AMP IS SWITCHED OFF AND UNPLUGGED.

When shipping your VAC amplifier, be certain to wrap the face plate in the cloth or tissue originally shipped from the factory. Take care to ensure that there are no ridges in the cloth. Use of a harsher cloth or the presence of deep wrinkles in the cloth may result in abrasion of the finish.

The brass plates on your amplifiers may have been shipped from the factory with a protective film covering, which should be removed for best appearance.

Ultra-linear or Triode?

The input amplifier, phase splitter, and driver stages are triode tubes operated in Class A with no cut-off or grid current. The output stage is connected for partial-triode, well known for low distortion, good damping factor, and high efficiency. This technique was invented by Alan Blumlein of EMI in England, and was popularized in the US as "ultra-linear." It is simple for a qualified service technician to connect the output stage for triode operation. Directions will be provided upon request. A triode/ultralinear switch may be installed by the factory.

Selection of Output Stage Operating Mode (Optional)

Optionally the VAC amplifier output stages may be operated in partial-triode (ultra-linear) or full triode modes, at your discretion via a single switch. We strongly suggest that you turn the power off before operating the mode switch. To change the mode, simply turn the switch between the transformers, being careful not to burn yourself on the output tubes. Turn the switch to the position indicated. Then power the unit up and listen.

Less power is available in the full triode mode. Experience reveals that the triode mode will sound somewhat lean on some systems and better defined on others. In many ways this is an issue of system matching, and universal recommendations do not exist.

For further information, refer to Tips & Advice: A Word About Output Stage Operating Mode.

Tube Cages (Optional)

Perforated metal cages are available to enclose the vacuum tubes and transformers. They attach with the two black headed screws located on each side of the chassis.

Need Help?

Please call us with any questions you may have. It is better to ask than to guess.

Warranty

This amplifier is warranted for a period of thirty (30) days from the date of purchase. In addition, if the registration card(s) is received by VAC *along with a copy of your sales receipt* from an authorized VAC dealer within this thirty days, a service contract will be extended to cover your equipment for two (2) years (except tubes which are covered for 90 days). Receipt of your registration card will be confirmed in writing by VAC.

This warranty applies only to units sold and operated in the United States of America through authorized VAC dealers. For warranty information outside of the U.S. contact the importer of VAC equipment for your country. Units sold outside of the U.S. should still be registered with VAC.

Mail this form along with a copy of your sales receipt as soon as possible to:

REGISTRATION FORM

Vintage High Power Mk II

Name _____

Address _____

_____

Telephone _____-_____-_____

Dealer name _____ Salesperson _____

" address _____

Purchase date _____ Serial Number_____

How did you first learn of VAC products? _____

Please provide any comments on VAC products or your dealer _____

_____

_____

Tips & Advice

A Word About Tubes in General

It is a truth that each brand of tube sounds different in a particular high resolution circuit. This is because no two manufacturers make a tube type in quite the same way, and the central tendencies of the performance parameters will differ slightly with each maker. To emphasize the point, examine the plate structure of any two 12AX7 from different manufacturers will probably find that they may not even the same shape and size. (Be careful here, as often a tube is made by a firm other than indicated on its label. In the heyday of tubes it was common to crossbrand between major labels, such as GE and RCA. Today many labels do not manufacture their tubes at all, including Gold Aero and RAM.)

This sonic variability may at first seem a liability, but further thought will reveal that it is an advantage, just like the ability to adjust VTA on a tone arm. The owner of a tube amplifier can select those tubes which sound like the real thing in his/her specific system. Of course, if the manufacturer you prefer is rare you may want to purchase a few spare tubes for the future.

How long should tubes last? It has long been known in professional circles (and probably now forgotten) that a tube such as the 12AX7 will display better performance characteristics after two years of continual operation than when it was new. In normal use it is not unusual for a low level tube to last 10 years or longer. Output tubes are another story, as they are continually providing significant amounts of current. Here the sound is your best guide. Certainly tubes should be replaced when the amplifiers can no longer meet specifications or when (if you have access to a tube tester) the tube's emission is significantly down or its transconductance is substantially out of specification. In normal use, output tubes will last at least 2 years and perhaps more than 10 years.

VAC will be happy to test tubes for concerned customers, providing transconductance, idle current and/or a photographic record of the tube's plate family curves.

TIPS & ADVICE

A Word About Output Tubes

Your VAC Amplifier can use 2 different output tube types: the KT88 Beam Power Kinkless Tetrode and the 6550A Beam Power Tetrode. We consider the sound of a good KT88 to be superior. Feel free to experiment with different brands and types to customize the sound to your tastes.

As with interconnects and speaker cables, each tube manufacturer's KT88 tends to have a distinct sound when used in VAC amplifiers, and of course the 6550As sound different as well. Here is a brief summary of our experiences with currently available tubes from different sources.

M-O Valve Company/Genalex/GEC KT88 (U.K.) PRE-1970:

An accurate and sweet tube with good bass quality. Quality is surprisingly variable for a premium tube. World wide supply is limited. *Highly recommended.*

M-O Valve Company/Genalex/GEC KT88 (U.K.) POST-1970:

Hard, glaring sound, only fair detail. Not recommended.

Golden Dragon KT88:

A new variant of the Chinese KT88 developed in Great Britain. An very good tube, close to the riginal, great speed, openness, imaging, and balance. *Highly recommended.*

Golden Dragon KT88S:

As above with greater reliability and power due to multi-metal laminated plate structure. Slightly more natural and airy sound.

Generic Chinese KT88 (including ARS, Gold Aero, Ram, Penta, Jolida, etc.):

Actually a fairly good sounding tube. Bass quality somewhat phasey, some mechanical sound due to a subjective dip in the upper-mid-range. Some samples make rather alarming noises on warm up and cool down, often heard through the speakers.

National NL-KT88-USA:

A new version on the KT88 produced by the US arm of the Richardson's organization. Visually very similar to the original and sonically satisfying, close to both the original and the Golden Dragon. Slightly lightweight sound, but sweet. Very expensive.

Golden Dragon 6550A:

Excellent tube with more subterranean bass and mid-range zing than a good KT88. Loses in terms of ease and dimensionality. May help wake up a sleepy system, but overall less natural. Good sound.

US made RCA and Tung-Sol 6550:

Early 6550 type in the "coke glass" bottle. Pretty good sound.

GE 6550A (applies to those manufactured in USA by MPD):

Overall hard and lacking in air. Not recommended.

Phillips/ECG/Sylvania 6550A:

Similar to the GE tube, perhaps a bit better.

TIPS & ADVICE

A Word About Low Level Tubes

The small tubes (Voltage Amplifier/Phase Splitter and Driver) in the VAC Amplifiers are type 12AU7. This tube is essentially the same as types 12AU7A, 5814, 6189, CV4003, ECC82, and E82CC. The quality of the tube used is by far more important than which of these (equivalent) types is used.

The preferred 12AU7A is the British/Chinese Golden Dragon. Acceptable alternate versions include the Brimar CV4003 (ladder plate version), Mullard CV4003 (very midrangy), generic Chinese 12AU7 (brighter), Sylvania 6189 (darker sound), the GE 12AU7A (slightly forward and grainy) and the Yugoslavian 12AU7 (cohesive and somewhat coarse).

Many classic tubes worth trying if you have access to them, such as those from Telefunken and Amperex, although a caution is in order, as we have recently seen East German EL34 relabelled "Telefunken West Germany." Tubes actually manufactured by RCA, Westinghouse, and Sylvania can be quite good, but the name on the tube doesn't always indicate who actually made it. Other names to watch for are Valvo, Mazda, Tung-Sol, Bendix, Mullard, Brimar, and Raytheon.

TIPS & ADVICE

A Word About Bias Levels

The output stage is designed to operate in rich Class AB_1 at an idle current of 83 milliamperes per tube, at approximately 550 VDC on the anodes and 500 VDC across the tubes. For more technical information about classes of operation see VAC Technical Monograph 90-8.

Some designers erroneously market a lower voltage and current operating point (as little as 26 mA) as "Class A_1." Be assured that the VAC and its tubes are strong enough to handle the more demanding, richer bias level. However, if you prefer the slightly greater tube life predicted by a lower idle current, you may adjust the bias level down somewhat lower, being sure to keep all four tubes at the same level. If you do, experiment with the output impedance connections for best sonic results.

TIPS & ADVICE

A Word About Impedance Matching

We strongly suggest that you experiment with the three available impedance connections for the best sonic match with your system. Since no loudspeaker represents an unchanging impedance at all frequencies, it is impossible to assert with certainty which output tap is appropriate to use. In many systems an amazing difference in sound will exist between the various impedance taps.

You should consider the output impedance markings on your VAC Power Amplifier as follows:

"8 ohms" matches loads between 4 ohms and 8 ohms
"4 ohms" matches loads between 2 ohms and 4 ohms
"2 ohms" matches loads between 1 ohm and 2 ohms

Most loudspeakers vary outside of any one of these ranges, which is why experimentation is essential. We often find that matching a speaker's minimum impedance is more important than matching its nominal (average) impedance.

If you bi-wire your system (run separate speaker leads from the amplifier to the high and low frequency transducers) you may discover that two different impedance taps work best. For example, with early Martin Logan Sequel II we find that the bass speaker is best matched with the 4 ohm tap, while the electrostatic panel is best controlled by the 2 ohm tap. To achieve this connection, the black leads of both speaker cables connect to "G", the red lead for the panel connects to "2", and the red lead for the woofer connects to "4". With later Sequels we use the 4 ohm connection for both drivers.

Contrary to popular misconception, no power is lost due to unused output taps. Also, the amount of negative loop feedback in the amplifier does not change, being fixed at approximately 8 decibels for all output taps. For more information consult VAC Technical Monograph 90-9.

TIPS & ADVICE

A Word About Output Stage Operating Mode (optional triode switch)

Triode amplification is the oldest form known, while partial triode ("ultra-linear") operation of pentodes and beam power tubes dates to 1937. From the engineering perspective, the triode mode differs from the ultra-linear mode in the following ways:

1) Somewhat more distortion at low power levels
2) Somewhat less distortion at moderate power levels
3) Reduced maximum power output
4) Output impedance matching is somewhat less critical
5) Increased damping factor.

The ultra-linear mode applies negative voltage feedback from the primary of the output transformer to the screens of the output tubes. The ultra-linear circuit displays different characteristics (efficiency, distortion components and levels, etc.) depending upon how much of the primary winding is common to both the screen and plate of the output tubes. The VAC implementation of the ultra-linear circuit has been selected to achieve performance quality as close to pure triode as possible while still increasing power output and efficiency.

Subjectively, the triode mode often produces a more natural sound provided that sufficient power is available for your application. Listen to both, and select the mode most pleasing in your system.

SPECIFICATIONS

The VAC System has been developed with the critical ear as the major arbiter of quality, with both conventional and unique measurements providing insight and guidance as necessary. The lack of emphasis on measurements is due to the fact that engineering's arsenal of equipment and techniques do not operate on the pattern recognition principals that control human perception of sound.

In the immortal words of Daniel von Recklinghausen, if it measures good and sounds bad it is bad. If it measures bad and sounds good you've measured the wrong things.

For those concerned with test bench performance, the following describes typical measured performance of a Vintage High Power operated at 120 VAC, 60 Hz.

Power Output: 98 watts continuous average power at 1 kHz with less than 1% THD into 6.6 ohms connected to the 8 ohm tap. Triode mode reduces power to 57 watts.

Frequency Response: down 0.5 dB at 5 Hz and 95 kHz, ref 0 dB = 1 watt @ 1 kHz.

(Note: response peaks will be observed at approximately 68 kHz and 190 kHz. Such peaks are present in all tube type transformer coupled power amplifiers, and are normally suppressed by the use of a phase compensation network in the negative feedback loop. VAC has deliberately avoided this technique, finding that it is sonically inferior to the slight ultrasonic peaks encountered with an excellent output transformer. The compensation technique looks good into a resistive load, but falters in the real world. Interested audiophiles should see Some Defects in Amplifier Performance Not Covered by Standard Specifications by Norman H. Crowhurst, published in the October 1957 **Journal of the Audio Engineering Society**.)

Power Bandwidth: down 0.5 dB at 14 Hz and 56 kHz, ref 0 dB = 90 watts @ 1 kHz.
down 3.0 dB at 9 Hz and 92 kHz, ref 0 dB = 90 watts @ 1 kHz.

Distortion: < .2% THD at 1 kHz 10 watts

Noise: S/N ratio > 85 dB

Sensitivity: .6 volts input for full power output

Negative Feedback: Loop feedback is fixed at approximately 8 dB regardless of output tap selected.

Absolute Polarity: Does not invert signal polarity.

Fuse: Slo-Blow type, 5A for 100 & 120 Volt configuration, 2.5A for 220 & 240 V.