The VM220 utilizes a compatible grounding system that generally does not require a "ground lifter" adapter plug on the AC power cord to minimize hum. The power cord on your VM220 has a standard three-prong grounding plug to provide maximum safety when it is connected to a ground wall receptacle. If there is any question regarding the safety of grounding procedures, be certain to seek competent help with the installation.

If electronic crossovers or other AC powered equipment is used with the VM220 it may be necessary to use "ground lifter" adapters on the power plugs of that equipment to minimize system hum. Generally, the lowest hum is achieved when the only direct connection between audio common "ground" and true earth ground occurs in the preamplifier, through its grounded power cord. Other equipment in the system should have some form of isolation to prevent ground loops and associated hum.

***Always place the power on-off switch on the panel of the VM220 in the "Off" position before connecting the power line cord to AC power.***

## Remote Turn-on Connections

The VM220 has a built-in 12VDC remote turn-on/off circuit for operation by a master control system in a home theater or large audio system. Use a 3.5mm (.140") diameter mono mini plug to connect to the +12V IN jack on the rear of the VM220. Two identical paralleled jacks are provided to allow chaining connections to control two or more VM220s or other equipment.

The +12V IN jack should be connected to the +12VDC output of the master control system, using a continuous +12VDC signal at 12mA per VM220 for the duration of amplifier on-time. Do not use a momentary or data pulse control signal.

The front power rocker switch on the VM220 must be off to use the remote turn-on. The front power rocker switch may still be used when the remote turn-on is connected, but the remote will not turn the VM220 off if the front power rocker switch is left on. The front power rocker switch will not turn the VM220 off if the remote system is on.

The +12VDC remote jacks have polarity protection, so they will not operate if a -12VDC signal is accidentally connected, or if the control wires are reversed. The 12V remote relay in the VM220 has click suppression to protect circuits in the master control system.

## Operating Procedure

1. Make sure you have read and complied with the INSTALLATION AND CONNECTION instructions prior to attempting operation.
2. Make sure your VM220 is properly connected to a high-current power receptacle via the attached power cord (see AC POWER CONNECTIONS).
3. Your preamplifier should be "on" and muted and/or set at minimum gain.
4. Turn the Power switch from "Off" to "On." The green power LED indicator should glow immediately. Note: If the power indicator LED fails to light, turn the Power switch to "Off" and check the appropriate fuse for possible failure. An extra fuse for A.C. power is included with your VM220.
5. Your VM220 should now operate satisfactorily. However, a full stabilization or warm-up time of approximately one hour is recommended for best sonic performance.
6. Note that the VM220 has a "hot start" preventive function. When the amp is turned off manually or shuts off due to A.C. power interruption, the amp cannot be restarted for approximately one minute. This prevents undue stress on the output tubes which can occur during a quick restart.

## Servicing

Because of its careful design and exacting standards of manufacture, your VM220 amplifier should normally require only minimal service to maintain its high level of performance.

**CAUTION:** The VM220 amplifier contains sufficient levels of voltage and current to be ***lethal.*** Do not tamper with a component or part inside the unit. Even with the power turned off, a charge remains in the energy storage capacitors for some time. Refer any needed service to your authorized Audio Research dealer or other qualified technician.

Replacement vacuum tubes may be obtained through your authorized retailer or directly from Audio Research Customer Service. For best performance, the 6550 output tubes should be matched pairs.

Additional questions regarding the operation, maintenance or servicing of your amplifier may be referred to Audio Research Customer Service at (763)-577-9700.

## Output Tube Bias Adjustment

As shipped from the factory, the output "bias" adjustments are set for a nominal 65mA per 6550 tube. Under these idle conditions the tubes are each dissipating approximately 27 watts of their 48 watt rating (42 watt plate, 6 watt screen). This point of operation provides "enriched" Class $AB_1$ and will satisfy the most critical listener.

For best results, operate and adjust the VM220 at 120VAC. Adjustment must be made under zero-signal conditions after at least 15-20 minutes of uninterrupted stabilization time.

# Model VM220

A digital voltmeter capable of accurate measurements with 0.1mVDC resolution is preferred for accurate adjustment (must have 3 1/2 digit display). Use the plastic alignment tool provided to make the adjustment. The measurement points are banana test jacks at the rear of the VM220. Adjust the "bias" for an average voltage reading of 65mVDC (.065 Volt DC) between test jacks.

## Cleaning

To maintain the new appearance of this unit, occasionally wipe the front panel and top cover with a soft, damp (not wet) cloth to remove dust. A mild, non-alkaline soap solution or dilute isopropyl alcohol may be used to remove fingerprints or similar smudges. Cleaners containing abrasives should ***not*** be used as they will damage the anodized finish of the front panel. A small, soft paint brush is effective in removing dust from bevels, the recessed nameplate and other features of the front panel.

## Limited Warranty

Audio Research Corporation products are covered by a 3-Year Limited Warranty, or a 90-Day Limited Warranty (vacuum tubes). This Limited Warranty initiates from the date of purchase, and is limited to the original purchaser, or in the case of demonstration equipment, limited to the balance of warranty remaining after original shipment to the retailer or importer.

In the United States, the specific terms, conditions and remedies for fulfillment of this Limited Warranty are listed on the warranty card accompanying the product in its shipping carton, or may be obtained from the authorized retailer or from the Audio Research Customer Service Department. Outside the United States, the authorized importing retailer or distributor has accepted the responsibility for warranty of Audio Research products sold by them. The specific terms and remedies for fulfillment of the Limited Warranty may vary from country to country. Warranty service should normally be obtained from the importing retailer or distributor from whom the product was purchased.

In the unlikely event that technical service beyond the ability of the importer is required, Audio Research will fulfill the terms and conditions of the Limited Warranty. Such product must be returned at the purchaser's expense to the Audio Research factory, along with a photocopy of the dated purchase receipt for the product, a written description of the problem(s) encountered, and any information necessary for return shipment. The cost of return shipment is the responsibility of the purchaser.

## Specifications

POWER OUTPUT: 200 watts per channel continuous from 20Hz to 20kHz. 1 kHz total harmonic distortion typically 0.5% at 200 watts, below .05% at 1 watt.

Approximate actual power available at "clipping" 230 watts (1kHz). (Note that actual power output is dependent upon both line voltage and "condition" i. e.: if power line has high distortion, maximum power will be affected adversely, although from a listening standpoint this is not very critical.)

POWER BANDWIDTH: (-3dB points) 10Hz to 100kHz.

FREQUENCY RESPONSE: (-3dB points at 1 watt) 1.0Hz to 140 kHz.

INPUT SENSITIVITY: 1.8V RMS Single-ended or balanced for rated output. (26.7dB gain into 8 ohms.)

INPUT IMPEDANCE: 100K ohms Single-ended, 200K ohms balanced differential

OUTPUT TAPS: 8 ohms, 4 ohms.

OUTPUT REGULATION: Approximately 0.8dB 8 ohm load to open circuit (Damping factor approximately 12).

OUTPUT POLARITY: Non-inverting from single-ended input. Balanced pin 2+ (IEC-268).

OVERALL NEGATIVE FEEDBACK: 14dB.

SLEW RATE: 25 volts/microsecond.

RISE TIME: 1.5 microseconds.

HUM & NOISE: Less than 0.2mV RMS – 106dB below rated output (IHF weighted, input shorted).

POWER SUPPLY ENERGY STORAGE: Approximately 332 joules.

POWER REQUIREMENTS: 105-125VAC 60Hz (210-250VAC 50Hz) 620 watts at rated output, 900 watts maximum, 400 watts at "idle".

TUBES REQUIRED: 4 – Matched pair 6550C – Power Output; 4 – 6N1P input and driver.

DIMENSIONS : 17.5" (44.5 cm) W x 7.9" (20.1 cm) H x 19" (48.3 cm) D. Rear connectors extend .88" beyond chassis.

WEIGHT: 54.7 lbs. (24.9 kg) Net; 63 lbs. (28.6 kg) Shipping.

Specifications subject to change without notice.

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# AUDIO RESEARCH TECH NOTES

## SUBJECT: VM220 SET UP WITH COMPLETE RETUBE

1) Referring to the enclosed diagram, remove the amplifier top plate. Install the four 6N1P tubes in V9 –V12 locations. For now, do not install the eight 6550C output tubes. If you are re-tubing a VM220 in the field, we will assume the RV1 and RV2 operating point trim pots have not been adjusted and are still factory-set. (If pots have been "tweaked" in the field, refer to step 5 below.) These are noted as 1 and 2 in the diagram. Plug in and power up the VM220. Allow the unit to run undisturbed for at least 20 minutes. Verify voltage of + 80V to +90V DC at point noted as 3 in the diagram. (Use the 4 ohm tap on the rear of the VM220 for ground connection of your DVM.)
2) Connect the positive DVM probe to point 4. Move the negative DVM probe to point 5. The difference voltage between points 4 and 5 should be less than 10 V DC. If difference voltage is greater than 10 V DC, swap V11 or V12 for V9 and/or V10 and allow circuit to stabilize 5 minutes and recheck if points 4 and 5 difference voltage is now less than 10 V DC. You may need to swap the 6N1Ps around or substitute other 6N1Ps if operating points will not adjust. (Do these tube swaps with amp on. This will minimize circuit settling time. Wear gloves to prevent burns from hot tubes.)
3) Once the 10 volt or less difference voltage at points 4 and 5 has been established, recheck for +80 V DC at point 3 with respect to ground. If not +80 V, adjust RV1 and RV2 at points 1 and 2 turning each trim pot the same direction in the same amount by ¼ turn increments until +80 V is achieved at point 3.
4) Power down VM220. Allow power supply voltages to bleed down for 5 – 10 minutes. Install the eight 6550C output tubes. Turn all eight of the bias trim pots near each V1 – V8 counterclockwise fully to reduce idle current until tubes are fully warmed up. Connect DVM set to mV DC to rear panel test points labeled V1. Turn on VM220. Verify bias setting is well below 65mV. Allow amp to warm up for 10 minutes. Slowly turn V1 bias pot clockwise until 65 mV reading is achieved. Repeat with the other seven output tubes. Recheck bias after ½ hour. Readjust as needed.
5) If RV1 and RV2 have been adjusted away from the factory settings, such that the operating points cannot be adjusted as detailed above, it will be necessary to reset the pots to a starting point of about 500 ohms. After amp has been off at least ½ hour to bleed down internal voltages, remove bottom cover. Locate the solder pads beneath RV1 and RV2. Measure across each pot with DVM set to ohms. Adjust each pot from topside of board to read 500 ohms. Repeat steps 1 through 3 above to achieve correct operating points.

Call Audio Research technical service at (763) 577-9700 between 8 and 4 CST for further assistance.