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# Owner's Manual

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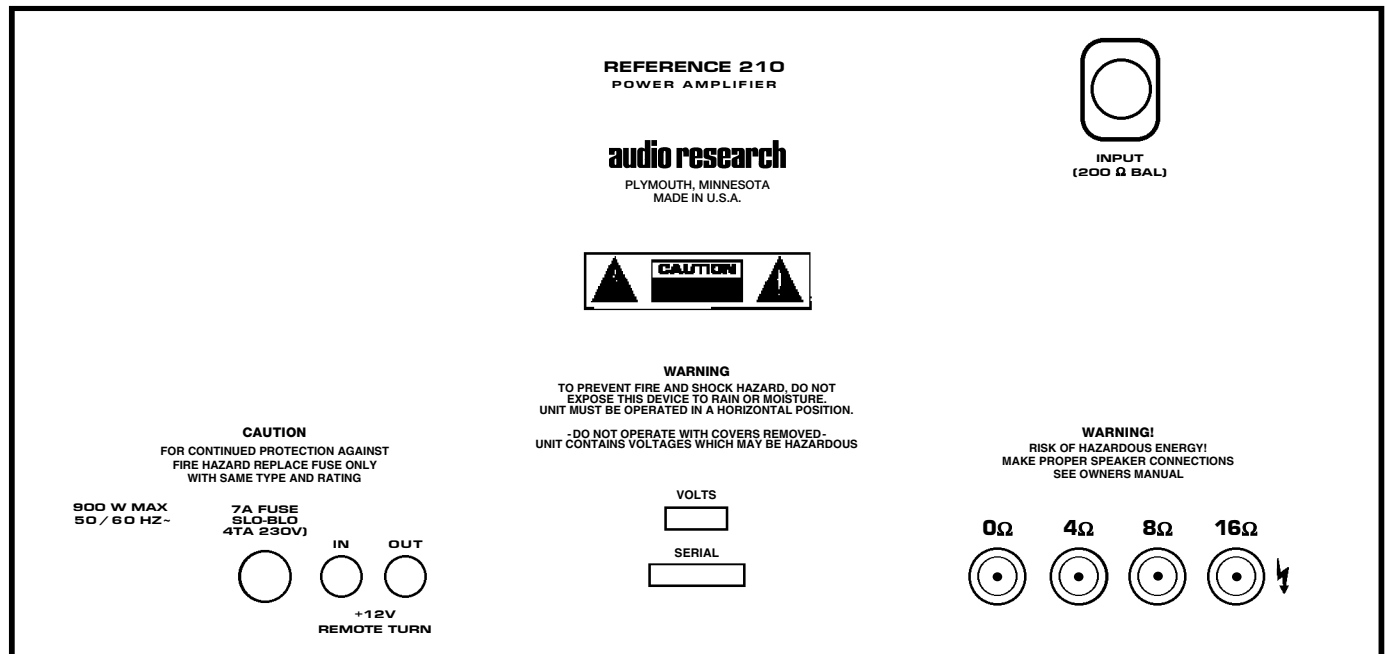
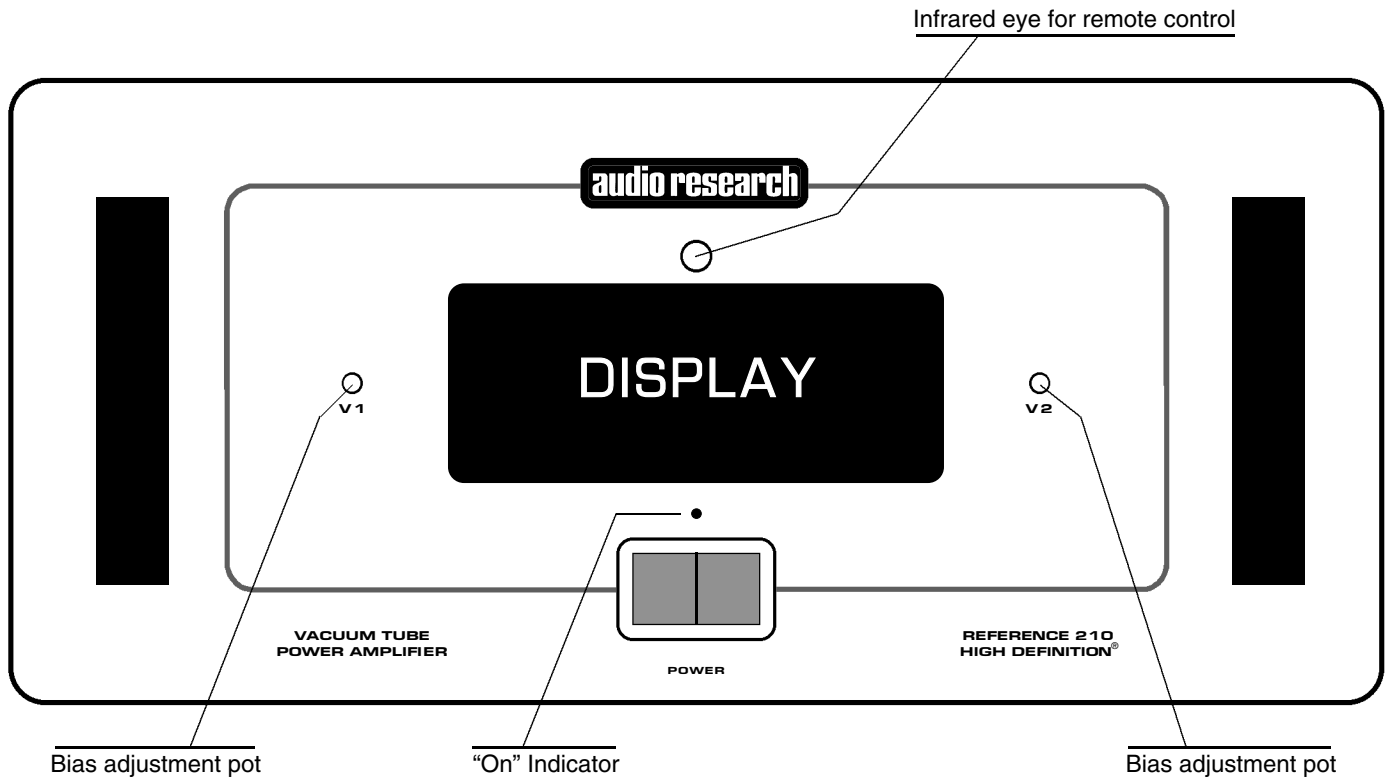
## **Model Reference 210**

**MONOBLOCK POWER AMPLIFIER**

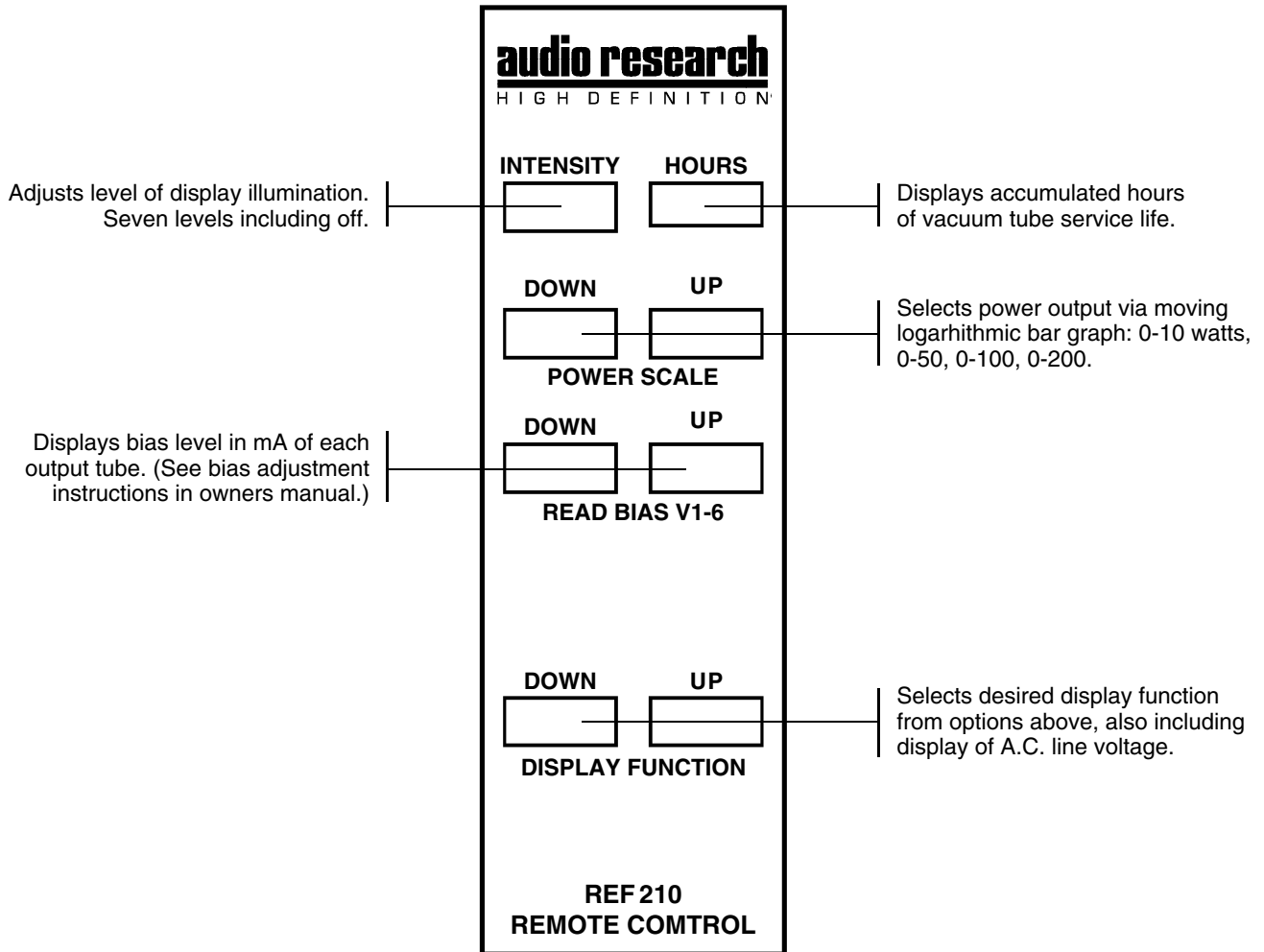
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## Preface

Please take time to carefully read and understand the following information and instructions before you install or attempt to operate your Audio Research Reference 210 vacuum tube monoblock power amplifier. Becoming familiar with important facts about your amplifier and its correct operating procedures will help assure maximum musical satisfaction and reliable operation.

## Packaging

Save all packaging accompanying this product. You have purchased a precision electronic instrument, and it should be properly cartoned any time shipment becomes necessary. It is very possible that this unit could be damaged during shipment if repackaged in cartoning other than that designed for it. The original packaging materials help protect your investment from unnecessary damage, delay and added expense whenever shipment of this unit is required.

## Accessories

- 1 – Phillips-head screwdriver for panel removal.
- 1 – Plastic screwdriver for front panel potentiometer bias adjustment.

## Fuses

- 1 – 2 Amp MDQ slo-blo for LV power transformer in 120V units.
- 1 – T1 Amp fast-blo for LV power transformer in 220, 240V units.
- 1 – 4 Amp MDQ slo-blo for start-up circuit in 120V units.
- 1 – T3.15 Amp fast-blo for start-up circuit in 220, 240V units
- 1 – 7 Amp MDX for main power in 120V units.
- 1 – T4 Amp fast-blo for main power in 220, 240V units.

## Vacuum Tubes and Preparation for Use

Do not attempt to operate this amplifier before installing the necessary vacuum tubes in their indicated sockets. The tubes are protectively packed in a separate carton; save packing for possible future use.

1. All input, driver and output-stage tube locations are clearly labeled with tube type and “V” number on one circuit board of the amplifier. There is one 6N1P input tube, two 6550C drivers, and 6-6550C output tubes. In addition, two power-supply regulator tubes—one 6N1P and one 6550C—are located on the second circuit board on the other side of the amplifier.

2. Match each tube's “V” number marked on the tube with the “V” number of the corresponding socket. Insert tubes by carefully aligning tube pins with socket holes and gently applying downward pressure. The base of the tube should firmly contact the surface of the socket.
3. **Note:** In general, contact enhancers are not recommended for use on vacuum tube contact pins. With continual exposure to heat and air, many of these substances can form gummy, dust-collecting residues which actually reduce contact and degrade sonic performance. Proper external use of these preparations – on interconnect plugs, speaker connections, etc.– is subject to the discretion of the owner. Contact Audio Research for specific recommendations.

## Installation

To insure normal component life and safe operation this unit **must be operated only in an upright position**. Adequate air flow and proper cooling can occur only if there is no restriction above and behind the unit and on either side. Be sure that airflow to the 12V D. C. cooling fan located on the rear panel is not blocked.

The special non-marring elastomer feet provide adequate spacing and stability only on a smooth, hard surface. **For upright stability, never operate the unit while it is sitting on a soft surface such as a thick rug or carpet.**

Due to its weight, this amplifier must be supported on a surface specifically rated for such a load. Check with the manufacturer of your support system to be sure it is rated to handle this weight.

If the unit is to be operated in an enclosure such as an equipment rack, make certain that adequate air flow above and to each side of the unit is provided. The “ambient” operating temperature should never exceed 120° F or 49° C. Improper installation will cause premature tube failure and will affect your warranty, as well as the service life of the unit.

It is normal for a vacuum tube power amplifier to run quite “warm”, and if used for prolonged periods, “hot” to the touch. All components within are, however, operated at safe, conservative levels and will not be improperly affected thereby, providing the requirements outlined above are adhered to.

## Warnings

1. To prevent fire or shock hazard, do not expose this product to rain or moisture.
2. This unit operates on voltages which can cause serious injury or death. Do not operate with cover removed. Any necessary servicing should be carried out by your authorized Audio Research dealer or other qualified

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electronics technician.

3. Use only the plastic insulated screwdriver included with this unit when making front panel bias adjustments.
4. The power cord on this unit is safety-tested and is equipped with a proper grounding plug. If used normally, it will provide a safe earth ground connection of the chassis. Defeat of the grounding plug, or any unauthorized modification of the active circuitry or controls of this unit, automatically voids warranty coverage.
5. For safe operation and protection against fire hazard, replace fuses only with those of the same type and rating as those supplied with this unit.
6. At 74 lbs. net weight per chassis, the Reference 210 amplifier is too heavy for one person to lift. To avoid injury, do not attempt to unpack, lift or move the unit without the help of at least one other person.
7. Always mute the preamplifier when cueing a phono cartridge stylus up or down.

Due to the immense power supply reserves, high power output, and wide bandwidth of the Reference 210, added emphasis must be placed on use of your preamplifier's mute switch from a safety standpoint. A transient signal burst or "pop" such as caused by tonearm cueing, accidental dropping or brushing of the phono cartridge stylus—even at a normal listening level—could cause an instantaneous peak power demand on the amplifier of up to 1000 watts (which the Reference 210 will try to deliver). The importance of lowering the preamplifier volume level to a minimum setting and activating the mute switch whenever cueing the tonearm or making contact with the phono cartridge stylus cannot be over-emphasized. Adhering to this precautionary muting procedure is equally important when turning your system on or off, and when connecting or disconnecting any cables in the system. Carefully following this recommendation will minimize the chance of causing undue stress and potential damage to your amplifiers and loudspeakers. (See your preamplifier Owner's Manual for more detailed instructions on use of muting provisions.)

## Description of Controls

### Front Panel Control

**POWER:** This switch turns the amplifier on and off. When turned on, there is an automatic warm-up sequence for approximately two minutes, during which "Mute" will flash in the display window. After this initial warm-up the amplifier is ready for listening. The display screen will default to the "Power Output" scale chosen previously. If turned off and then on again, the amplifier will repeat the 2-minute slow-start cycle. We recommend that the Reference 210 be

switched to "Off" when there are protracted intervals between listening sessions.

### Display Screen

The screen displays all functions and operating modes as they are selected. Power Output bar graph as normal default in Operating Mode; large numerals for A. C. line voltage; large numerals for bias check; and small numerals for total hours accumulated. Note that the "Hours" function will turn off after ten seconds.

In the event of low-A. C. line conditions while in "Operate", the amplifier automatically mutes the output and the screen displays "Mute" and "Low Line." (This also occurs for 3 seconds at turn-on.) When sufficient A.C. supply resumes, the amplifier will enter its normal two-minute warm-up cycle.

### Handheld Remote Control Functions

All display functions of the Reference 210 must be addressed by pressing buttons on the handheld remote control. Note that power on/off can only be selected by using the front-panel switch or via the 12V trigger.

**INTENSITY:** Adjusts level of display screen illumination to any of seven levels including full off.

**HOURS:** Displays accumulated hours of vacuum-tube service life, up to 500,000 hours. If the amplifier is unplugged from A.C. supply, total accumulated hours are retained. May be reset by qualified technician. Contact Audio Research Customer Service for more information about reset procedure.

**POWER SCALE DOWN/UP:** Selects and displays power output scale via moving logarithmic bar graph: 0-10 watts, 0-50 watts, 0-100 watts, 0-200 watts. The normal default display mode when the amplifier is in Operate.

**READ BIAS V1-V6 DOWN/UP:** Displays bias level of each output tube in mA. When selected, V1 or V2 may be adjusted by inserting the supplied flat-bladed tool into the respective adjustment pot on the front panel and rotating until "65 mA" appears in the display. All other tube locations (V3-V6) may only be checked for bias level, not adjusted. They should normally display a bias value between 57 and 73 mA. Note that amplifier is muted in this mode. Please read "Bias Adjustment Procedure" on page 3

**DISPLAY FUNCTION DOWN/UP:** Selects desired display function from options listed above, also including

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display of A.C. line voltage entering the amplifier, shown in large numerals. Amplifier is muted when checking line voltage.

## Connections

**INPUT CONNECTOR:** The Reference 210 uses a fully balanced circuit topology and thus has one balanced XLR input connector on the rear panel. It therefore requires a balanced preamplifier output, as provided by most Audio Research preamplifiers. Connect your preamplifier's output to the Reference 210 before turning on the amplifier.

**OUTPUT CONNECTORS:** Proprietary, heavy-duty output terminals are provided on the rear panel for 4, 8, or 16-ohm speaker impedance loads. Using high-quality speaker cables, securely fasten the (-) speaker lead to the appropriate (-) terminal, then the (+) lead to the matching (+) terminal, following your speaker manufacturer's impedance specification. The Reference 210 puts out the same amount of power whether the 4, 8 or 16-ohm terminals are used.

**IMPORTANT:** Use the best available speaker wires and interconnects. Audio Research cannot emphasize this enough. As better components and systems are developed, it becomes increasingly important to avoid the limitations of inferior system interconnections.

It is important sonically that your entire system be connected so that the audio signal arriving at the speakers has correct, or "absolute" polarity (i.e., non-inverted). Connect the black or "-" speaker terminal to the wire that connects to the "0" terminal on the Reference 210. Connect the red or "+" speaker terminal to the wire that connects to the "4" or "8" terminal on the Reference 210, and tighten the speaker terminals securely to ensure best sonic results.

**MATCHING:** It is important to use as close as possible an impedance match between the amplifier and speaker for optimum transfer of power to the speaker with minimum distortion. In the case of speaker systems with significant variations in impedance throughout the frequency spectrum, such as most electrostatic types, determine the best impedance match empirically for best overall sonic results.

Connect the Reference 210 input to the preamplifier or electronic crossover, using only the highest grade of audio interconnect cables. To avoid sonic degradation use the shortest practical length of cables.

**A.C. POWER CONNECTIONS:** It is important that the Reference 210 be connected via its supplied 20 amp IEC 12-gauge power cord to a secure, dedicated A.C. power receptacle. Never connect to convenience power receptacles on other equipment. Only use the power switch on the front of the Reference 210 for On/Off control of the amplifier, or the 12V start-up trigger for remote installations.

The A.C. power source for the Reference 210 should be capable of supplying 20 amperes for 120V units, or 10 amperes for 220/240V units. Preferably, the amplifier should be connected to its own A.C. power circuit branch, protected by a 20-30 amp circuit breaker. The preamplifier and other related equipment should be connected to a separate power circuit and breaker. If the power receptacle is more than 25 feet from the building's power entrance and breaker box, circuit wiring capable of 30 amperes should be installed to minimize voltage drop using a 20-amp breaker. Avoid the use of extension cords. If they must be used on a temporary basis, use 12-gauge cords or heavier.

The Reference 210 should be turned on **after** the other components of your system. If the Reference 210 is turned on before other components, the amplifier will amplify any extraneous turn-on noises those components might generate, which could potentially damage the loudspeakers. **Good operating practice dictates that the amplifier should be turned on last, and turned off first in an audio system.**

The Reference 210 uses a grounding system that does not require a ground-lifter adaptor plug on the A.C. power cord to minimize hum. The power cord supplied with the Reference 210 has a standard grounding plug to provide maximum safety when properly connected to a grounded wall receptacle. If there is any question regarding proper grounding procedures in your installation, seek help from a qualified technician. Caution should be taken before using custom after-market power cords: they must be at least 12-gauge and have a standard grounding plug properly installed. These power cords are to be used with caution, at the sole risk of the owner.

If electronic crossovers or other AC powered equipment is used with the Reference 210 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 Reference 210 in the "Off" position before connecting the power line cord to AC power.***

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## Remote Turn-on Connections

The Reference 210 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 Reference 210. Two identical paralleled jacks are provided to allow chaining connections to control two or more Reference 210s 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 Reference 210 for the duration of amplifier on-time. Do not use a momentary or data pulse control signal.

The front power rocker switch on the Reference 210 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 Reference 210 off if the front power rocker switch is left on. The front power rocker switch will not turn the Reference 210 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 Reference 210 has click suppression to protect circuits in the master control system.



## Operating Procedure

### Start-Up:

1. Secure input connection between the amplifier and your preamplifier; attach speaker leads to the appropriate output terminals.
2. Attach supplied power cord to rear IEC inlet of amplifier, and plug other end into grounded A. C. power receptacle.
3. Turn on preamp and all other components; mute preamp output.
4. Turn Reference 210 front-panel control from Off to On; display will show "Low Line" for approximately 3 seconds until power relay engages. A two-minute mute/warm-up cycle will follow.
5. Select display function desired if other than "Power Scale."
6. Unmute preamplifier output, initiate source component signal, and adjust gain as appropriate.

### Shut-Down:

1. Mute preamplifier output.
2. Turn Reference 210 front-panel control from Operate to Off.
3. Turn off preamplifier and then the associated input source components.

## Bias Adjustment Procedure

1. Amplifier should be turned on and operating for at least 30 minutes before adjusting bias of output tubes.
2. Select bias level function in display screen using the remote control. The 210 will mute. Display will default to V1 location, showing bias level and instructions to adjust bias to 65mA.
3. Using supplied flat-bladed tool, insert into V1 pot opening on front panel and rotate until screen reads 65mA.
4. Using the remote control, switch to V2 location and repeat adjustment procedure.
5. Check bias level for all other output tubes (V3–V6); each should measure in the range of 57mA to 73mA. If a tube persistently measures outside this range, it should be replaced.
6. Once tubes have been adjusted and checked for bias level, return display screen to Power Scale function and amplifier is ready to play.

The Reference 210 is shipped from the factory with all tubes properly biased and ready to use. It is not necessary to check bias each time the amplifier is turned on.

Under typical circumstances, most owners will find that checking the bias level once a month or so will insure proper operation and good service life of the output tubes. Audio Research-supplied output tubes are warranted for 90 days, and under normal conditions should provide up to 2000 hours of service life. This expected life will vary depending on conditions of use—ventilation, speaker loads, average playing level and A. C. voltage and line condition.

Complete sets of replacement tubes or individual tubes are available from Audio Research, and are strongly recommended for best sonic performance and reliability. These tubes are burned in, measured, matched and specifically selected for your Audio Research amplifier. Contact your authorized dealer for suggested retail prices.

## Cooling Fan

The high-quality 12V D.C. fan is single-speed and is not adjustable. It operates at a speed selected to provide adequate cooling of the tubes with a minimum of air turbulence or noise.

## Servicing

Because of its careful design and exacting standards of manufacture, your Reference 210 amplifier should normally require only minimal service to maintain its high level of performance.



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**CAUTION:** The Reference 210 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.

Additional questions regarding the operation, maintenance or servicing of your amplifier may be referred to the Customer Service Department of Audio Research Corporation at 763-577-9700 (CST). When ordering a service manual from Audio Research or an authorized dealer, be sure to identify the serial number on your amplifier.

## Cleaning

To maintain the new appearance of this amplifier, occasionally wipe the front panel and top cover with a soft, damp (not wet) cloth to remove dust. A mild, non-alkaline soap solution 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.

## Disposal and Recycling Guidelines

To dispose of this electronic product, do not place in landfill. In accordance with the European Union Waste Electrical and Electronic Equipment (WEEE) directive effective August 2005, this product may contain regulated materials which upon disposal require special reuse and recycling processing.

Please contact your dealer or importing distributor for instructions on proper disposal of this product in your country. Or, contact Audio Research Corporation (763-577-9700) for the name of your importing distributor and how to contact them.

Packing and shipping materials may be disposed of in a normal manner.

## 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:** 210 watts per channel continuous from 20Hz to 20kHz. 1kHz total harmonic distortion typically 0.5% at 210 watts, below .02% at 1 watt.

Approximate actual power available at "clipping" 240 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 150kHz.

**FREQUENCY RESPONSE:** (-3dB points at 1 watt) 0.5Hz to 240 kHz.

**INPUT SENSITIVITY:** 1.7V RMS Balanced for rated output. (27 dB gain into 8 ohms.)

**INPUT IMPEDANCE:** 200K ohms Balanced.

**OUTPUT TAPS:** 4, 8, 16 ohms.

**OUTPUT REGULATION:** Approximately 0.6dB 16 ohm load to open circuit (Damping factor approximately 14).

**OVERALL NEGATIVE FEEDBACK:** 12dB.

**SLEW RATE:** 40 volts/microsecond.

**RISE TIME:** 1.2 microseconds.

**HUM & NOISE:** Less than 0.3mV RMS – 106dB below rated output (IHF-A weighted, input shorted, 16 ohm output).

**POWER SUPPLY ENERGY STORAGE:** Approximately 787 joules.

**POWER REQUIREMENTS:** 105-130VAC 60Hz (260-250VAC 50Hz) 680 watts at rated output, 950 watts maximum, 380 watts at "idle", .15 watts off.

**TUBES REQUIRED:** 3 – Matched pair 6550C (Power output V1-6); 1 – Matched pair 6550C (Driver V8-9); 2 – 6N1P (Gain stage V7 and Regulator Driver V10); 1 6550C (Regulator V11).

**DIMENSIONS :** 19" (48.3 cm) W x 8.75" (22.2 cm) H x 19.5" (49.5 cm) D. Handles extend 1.5" (3.8 cm) forward.

**WEIGHT:** 74 lbs. (33.6 kg) Net; 89 lbs. (40.4 kg) Shipping.

Specifications subject to change without notice.

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