



REF 160M

User's Manual

**Customers Come First
Quality Every Day
Advancing Our Legacy
Commitment to Excellence**

audio research
HIGH DEFINITION®

Thank you for choosing the Reference 160M to be a part of your high performance music listening system. After nearly 50 years, our focus remains the advancement of the state-of-the-art in music reproduction. Every component is meticulously hand-crafted and personally auditioned before it leaves our factory. Our attention to detail, customer service, and product support create unprecedented value. An Audio Research component is more than a purchase, it's an investment.

We understand you are eager to begin listening; however, please take a few minutes to read through this guide for useful information concerning the operation of your new amplifier. Once installed, please allow an appropriate break-in period to fully appreciate the benefits this amplifier will provide to your system.

After reading the user guide, if you have further questions regarding your amplifier, contact your dealer or Audio Research customer service—they will be happy to help you make the most of your new component.

Happy Listening!

Thank You.

Safety Instructions

Important Safety Instructions



The lightning flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated “Dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equi-lateral triangle is intended to alert the user to the presence of important operating and maintenance (Servicing) instructions in the literature accompanying the product.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer’s instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer

Safety Instructions



- 12.** Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over
- 13.** Unplug this apparatus during lightning storms or when unused for long periods of time.
- 14.** Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- 15.** WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE
- 16.** DO NOT EXPOSE THIS APPARATUS TO DRIPPING OR SPLASHING AND THAT NO OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, SHOULD NOT BE PLACED ON THE APPARATUS and NE PAS EXPOSER CET APPAREIL À DES ÉCLABOUSSURES OU GOUTTELETTES D'UN LIQUIDE. AUCUN OBJET REMPLI DE LIQUIDE COMME PAR EXEMPLE UN VASE NE DOIT ÊTRE PLACÉ SUR L'APPAREIL.
- 17.** TO COMPLETELY DISCONNECT THIS APPARATUS FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE. POUR DECONNECTER COMPLETEMENT L'APPAREIL DU RESEAU D'ALIMENTATION, DECONNECTER LE CORDON D'ALIMENTATION DE LA PRISE MURALE.
- 18.** THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY ACCESSIBLE. LA PRISE DU RESEAU D'ALIMENTATION DOIT DEMEURER AISEMENT ACCESSIBLE.w

Contents

Safety Instructions	2	Maintenance	15
Warnings	5	Vacuum Tubes	15
A note about packaging.....	5	Servicing	15
Installation	6	Caution	15
Top view	6	Cleaning.....	15
Before operating the reference 160M	6	Disposal and Recycling Guidelines.....	15
In your system	7	Warranty	16
A note about vacuum tubes	7	Specification	17
Life Expectancy	7		
Connections	8		
Back Panel Connections.....	8		
Input Connectors	8		
Output Connectors.....	8		
Matching.....	9		
Loudspeaker Cable Distance	9		
Remote Turn-on	10		
RS-232 Control	10		
A.C. Power Connection	10		
Operation	11		
Front Panel Controls and Displays.....	11		
Start-Up.....	12		
Shut-Down	12		
Front Panel Button Functions	13		
Back Panel Toggle Switch Functions.....	13		
Auto Shut Off.....	13		
Auto Bias	14		
Hour Counter	14		
Break-in.....	14		

Warnings

To prevent fire, or shock hazard, do not expose your Reference 160M to rain or moisture.

Do not place objects containing water on top of this unit.

This unit contains voltages which can cause serious injury or death. Do not operate with covers removed. Refer servicing to your authorized Audio Research dealer or other qualified personnel.

The detachable power cord on your Reference 160M is equipped with a heavy gauge, 3-conductor cable and a standard three-prong grounding plug in North America. For absolute protection, do not defeat the ground power plug. This provides power line grounding of the Reference 160M chassis to provide absolute protection from electrical shock.

The appliance coupler (a.c. power connector) at the rear of this unit must be accessible for emergency power disconnect.

For continued protection against fire hazard, replace the fuse only with the same type and rating as specified at the fuse holder.

The power button on the front of this unit, when off, does not disconnect all power from this unit. This unit is in sleep mode when not on.

This unit is RoHS compliant.

A note about packaging...

Save all packaging in a dry place away from fire hazard. Your Reference 160M amplifier is a precision electronic instrument and should be properly cartoned any time shipment is made. You may not have occasion to return your unit to the factory for service, but if that should prove necessary, or other occasion requiring shipment occurs, the original packaging will protect your Reference 160M from unnecessary damage or delay.

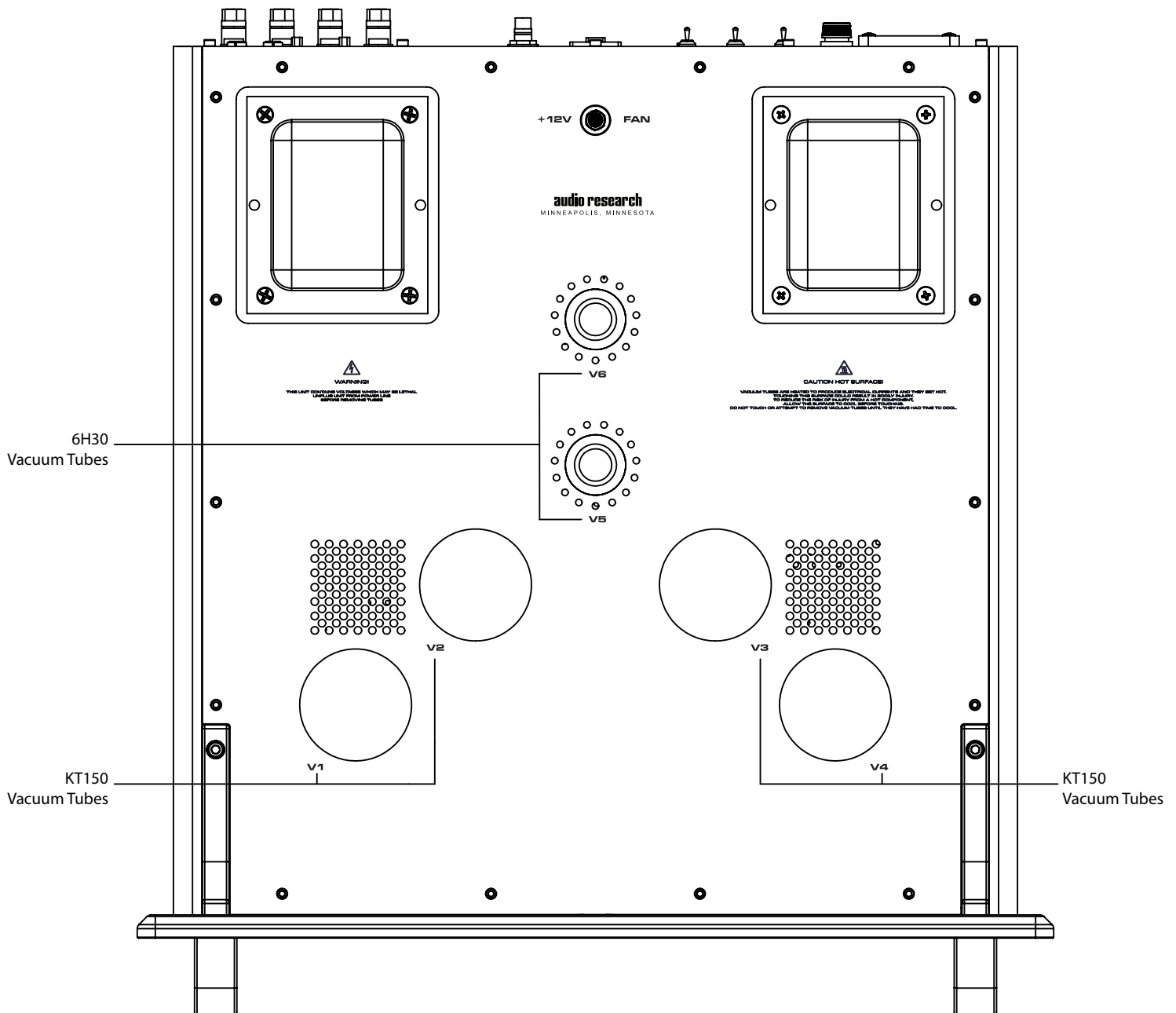


Important!

The AC Power Supply Cord must be disconnected from the amplifier before replacement or installation of vacuum tubes.

Installation

Top View



Before operating the Reference 160M

Your Reference 160M amplifier is shipped with the vacuum tubes packed in foam blocks. These must be unpacked and installed before you attempt to operate the amplifier. Included are a matched quad of KT150 output tubes and (2) 6H30 dual

triode driver tubes. Proceed according to the following instructions.

Remove all screws fastening the top cover. Carefully remove each vacuum tube from its protective foam and match its location 'V' number (written on the base of the tube)

Installation

to the 'V' number printed next to each socket. Firmly seat each tube in its matching socket, taking care to 'key' the tube pins to the socket holes. Retain the foam blocks with other packing materials for possible future use.

Refasten top cover on amplifier. Connect the fan power plug to its socket at the rear of the amplifier top plate.

In your system

To insure normal component life and safe operation this unit must be operated only in an upright position. Adequate airflow and proper cooling can occur only if there are no restrictions 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, and also assist to isolate the amplifier from spurious vibrations. For upright stability and best performance, 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 airflow above, to each side, and to the rear of the unit is provided.

In any installation, there should be a minimum of 8 inches of clearance above the top of the amplifier.

The 'ambient' operating temperature should never exceed 86° F (30° C). Improper installation will cause premature tube failure and will affect your warranty, as well as the service life of the unit.

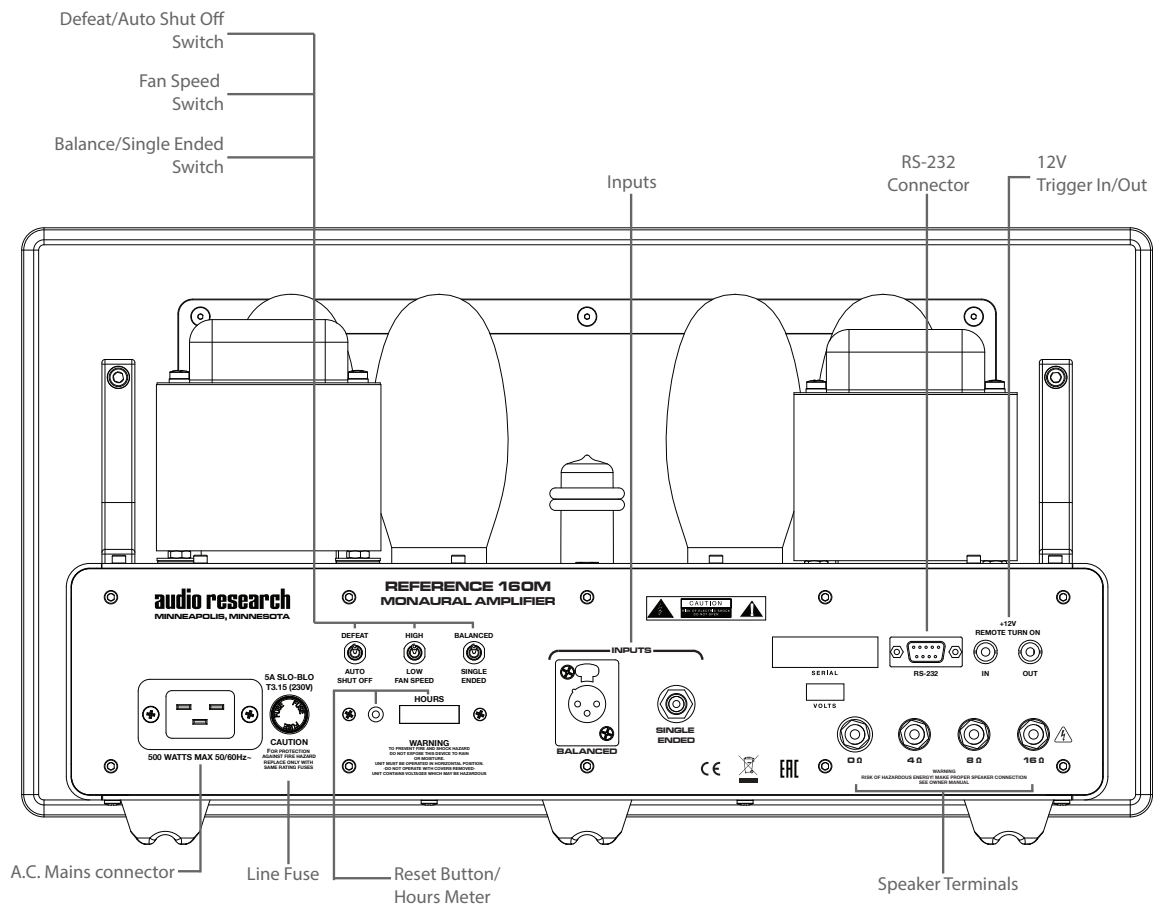
It is normal for a vacuum tube power amplifier to run quite warm, and if used for prolonged periods, hot to the touch. All components within are, however, operated at safe, conservative levels and will not be improperly affected thereby, providing the requirements outlined above are adhered to.

A Note about Vacuum Tubes Life Expectancy

The vacuum tubes in your Reference 160M have been burned in, tested and electrically matched to provide the best performance and reliability of your amplifier. That said, vacuum tubes must be replaced from time to time. The KT150 output tubes in the Reference 160M should have an expected life of approximately 3,000 hours, while the smaller 6H30 tubes should have a life expectancy of approximately 4,000 hours. These life expectancies are only approximate.

Connections

Back Panel Connections



Input Connectors

The Reference 160M uses a fully balanced circuit topology and has a balanced XLR input connector and a single-ended RCA input connector on the rear panel. The rear panel switch must be in the appropriate labeled position for either balanced or single-ended use. Connect your preamplifier's output to the REF 160M input connector before turning on the amplifier. Do not connect the balanced XLR input connector and single-ended RCA input connector at the same time –connect one or the other in the same way for both channels.

Output Connectors

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 (black) terminal, then the (+) lead to the matching (red) terminal. 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). Do not over tighten the output terminal connectors on the amp (use a hex driver and tighten snugly -do not over tighten). Follow your speaker manufacturer's impedance specification. The Reference 160M puts out the same amount of power whether the 4, 8, or 16-ohm terminals are used.

Connections

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 160M 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.

Important

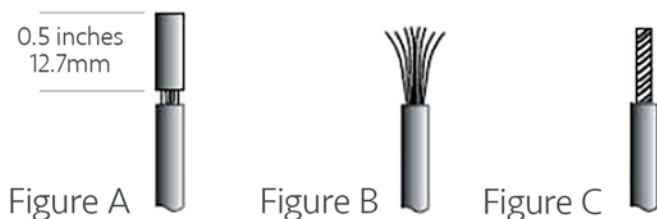
Use the best available speaker wires and interconnects. Audio Research cannot emphasize this enough. As better components and systems are developed, it becomes increasingly important to avoid the limitations of inferior system interconnections.

When connecting Loudspeakers to the REF 160M it is very important to use cables of adequate size, so there is little to no power loss in the cables. The size is specified in Gauge Numbers or AWG (American WireGauge). The smaller the Gauge number, the larger the wire size:

Loudspeaker Cable Distance vs. Wire Gauge Guide			
Loudspeaker Impedance	25 feet (7.62 meters) or less	50 feet (15.24 meters) or less	100 feet (30.48 meters) or less
4 Ohms	14AWG	12AWG	10AWG
8 Ohms	16AWG	14AWG	12AWG
16 Ohms	18AWG	16AWG	14AWG

Prepare the Loudspeaker Hookup Cable for attachment to the REF 160M Power Amplifier Circuitry.

Bare wire cable ends: carefully remove sufficient insulation from the cable ends, refer to figures A, B & C. If the cable is stranded, carefully twist the strands together as tightly as possible.



Notes:

1. If desired, the twisted ends can be tinned with solder to keep the strands together.
2. The prepared bare wire cable ends may be inserted into spade lug connectors.
3. Banana plugs are for in the United States and Canada only.

Connections

Remote Turn-on

The Reference 160M has a built-in 12V DC 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 mini plug to connect to the +12V IN jack on the rear of the Reference 160M. The tip of the mini plug is +12V and the sleeve is ground.

The +12V IN jack should be connected to the +12V DC output of the master control system, using a continuous +12V DC signal at 12mA per Reference 160M for the duration of amplifier on-time. Do not use a momentary or data pulse control signal.

The +12V DC remote jacks have polarity protection, so they will not operate if a -12V DC signal is accidentally connected, or if the control wires are reversed.

RS-232 Control

The REF 160M has an RS-232 connector on the back panel, in the event the amplifier is incorporated into an automated or two-way remote communication system. Please see your dealer or contact customer service at Audio Research to acquire specific codes relative to the RS-232 control.

A.C. Power Connection

It is important that the Reference 160M 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 160M for On/ Off control of the amplifier, or the 12V start-up trigger or RS-232 for remote installations.

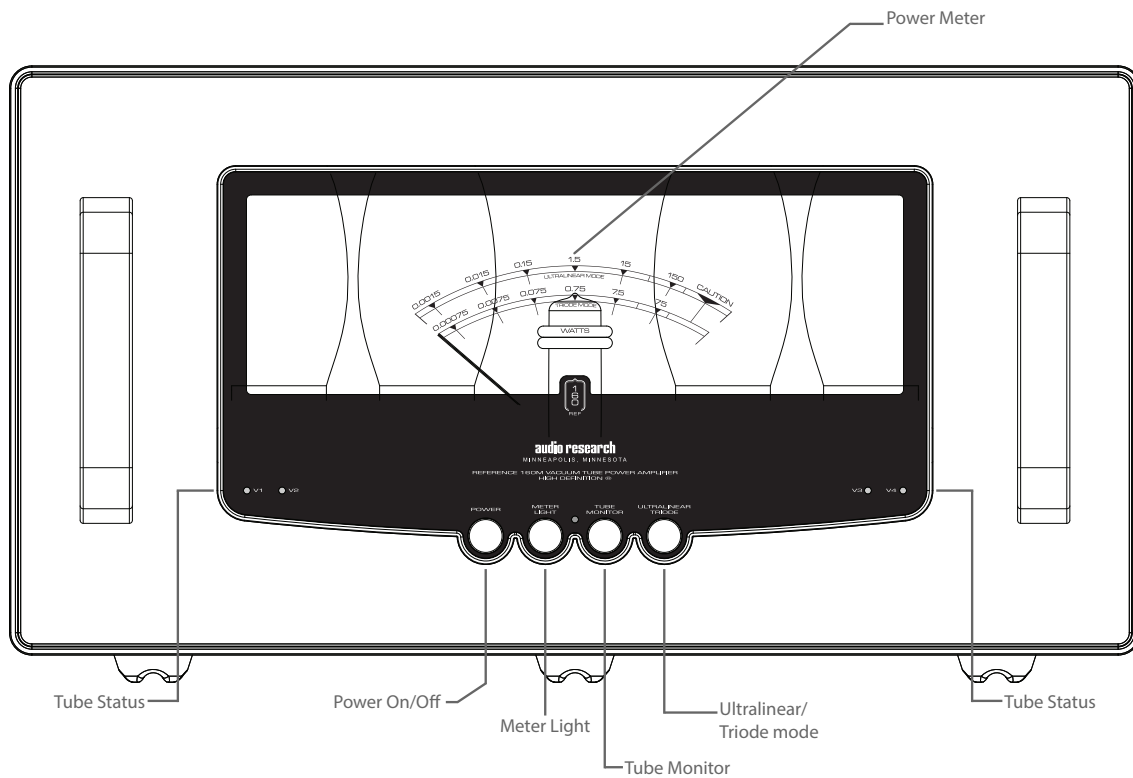
The AC power source for the Reference 160M amplifier should be capable of supplying 15 amperes for 100 or 120 volt units, or 10 amperes for 220 or 240 volt units.

For the very best performance on 100 or 120 volt circuits, the Reference 160M should be connected to its own AC power circuit branch, protected by a 15 (or 20) amp breaker. The preamplifier and other audio equipment should be connected to a different power circuit and breaker.

The Reference 160M uses a grounding system that does not require a ground-lifter adapter plug on the A.C. power cord to minimize hum. The power cord supplied with the Reference 160M 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 160M it may be necessary to use 'ground lifter' adapters on the power

Operation

Front Panel Controls and Displays



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.

Operation

Start-Up

- Secure interconnects between the amplifier and your preamplifier; attach speaker leads to the appropriate output terminals.
- Attach supplied power cord to rear IEC inlet of amplifier, and plug other end into grounded A.C. power receptacle.
- Turn on preamp and all other components; mute preamp output.
- Press Reference 160M front panel power switch. Green power LED will flash dim-to-bright for approximately 2 minutes during the auto mute cycle to allow the amplifier to stabilize voltage before becoming active. The LED will stay on brightly, once the amplifier has stabilized.
- Note: the Reference 160M should be turned on after the other components of your system. If the Reference 160M is turned on before other components, the amplifier will amplify any extraneous turn-on noises those components might generate, which could potentially damage loudspeakers. Good practice dictates that the amplifier should be turned on last and turned off first in an audio system.
- Unmute preamplifier output, initiate source component signal, and adjust gain as appropriate.

Shut-Down

- Mute preamplifier output.
- Turn off Reference 160M via front panel power switch. (or 12V trigger or RS-232)
- Turn off preamplifier and then the associated input source components.
- The control circuitry is programmed to prevent turning the unit on within approximately 2 minutes after shut-down.



Important!

After the Reference 160M is tuned off, wait at least five minutes before turning it on again. This allows the large bank of storage capacitors to drain energy. Not allowing enough time for this process can result in blown fuses or other damage to your amplifier.

Operation

Front Panel Button Functions

Power

Turns power of REF 160M on or off.

Meter Light

Adjusts meter light LED display brightness to one of four levels of brightness including "off".

Tube Monitor

Allows checking the operation of each of the four KT 150 output tubes (V1-V4). The LED associated with each output tube will illuminate when operating properly. See Auto Bias section under Operation for further explanation of its operation.

Ultra-Linear/Triode

Allows selecting ultra-linear (approximately 150 watts/ch.) operation – indicated by green color of LED above this function button, or triode (approximately 75 watts/ch.) operation – indicated by blue white color of LED above this function button.

Back Panel Toggle Switch Functions

Auto Shut Off/Defeat

Allows selecting auto shut-off feature or turning off this feature (see separate Auto Shut Off paragraph under this Operation section for a more detailed description of this function).

High/Low Fan Speed

Allows adjusting fan speed of top cover/fan assembly to either low or high-speed setting.

Balanced/Single Ended

Select balanced switch position for balanced input connection operation or single-ended switch position for single-ended input connection operation. Do not connect BAL and SE cables simultaneously. (See Input Connectors paragraph under Connections section for further information.)

Auto Shut Off

The REF160M is equipped with an auto shut-off feature, designed to turn the amplifier off after two hours of no signal being present at the output of the amplifier.

In the event that quiet music is listened to at very low volumes, there may not be adequate signal for the auto shut off circuit, resulting in the amplifier turning itself off. If this is the case, please disengage the auto shut off feature. The auto shut off feature control switch is located on the back panel of the REF 160M. Toggling the switch allows you to turn the feature on or off.

Note: The auto shut off feature is not in the signal path of the amplifier and has no deleterious sonic effect on music playback.

Operation

Auto Bias

The REF160M incorporates a highly sophisticated auto-bias circuit. There are no user-adjustable bias controls. There should never be a need to check or adjust the auto-bias circuit: once it is factory set, no additional adjustment is required. The auto-bias circuit will “lock in” the idle current of each bank of two KT150 output tubes approximately two minutes after the REF160M is turned on, and continually compensates to maintain the proper bias as the tubes age. Auto-bias sets the idle current at 65mA per tube.

It is always recommended owners purchase replacement tubes from Audio Research Corp. Since the auto bias adjusts pairs of tubes, not each individual tube, it is important that matched sets of four KT 150 output tubes be installed for optimum performance and longest tube life.

The auto bias circuit will not accommodate output tubes with extremely high or low plate current readings. Aftermarket tubes may not be tested to the same rigorous standards as Audio Research tests, so care must be exercised when installing aftermarket tubes. If uncertain about aftermarket tube requirements, please contact Audio Research Customer Service for recommendations.

Hour Counter

An LCD hour counter of elapsed tube operating time can be viewed on the back panel. This displays accumulated hours of vacuum tube service life. If the amplifier is unplugged from A.C. supply, the total accumulated hours are retained. Next to the hour counter is a recessed hour counter reset button; after replacing vacuum tubes, press this button to reset the hour counter back to zero. Note that once the hour counter has been reset, it is no longer possible to recall the previous hour count.

Break-in

All quality stereo equipment benefits from a break-in period; during this time, the various components, wiring and solder connections change as electrical signals pass through them. While your Reference 160M will sound fantastic out of the box, it will only improve with continued use.

Maintenance

Vacuum Tubes

It is recommended that you replace the vacuum tubes of your Reference 160M in sets. All of the tubes in your amplifier have been matched to have similar operating characteristics, to provide the best sound quality and reliability. In the event you need to replace a single output tube, please refer to the numbers written on the silver base at the bottom of the vacuum tube when placing an order. KT150 tubes should be replaced at approximately 3000 hours. 6430 tubes should be replaced before 4000 hours.

Servicing

Because of its careful design and exacting standards of manufacture, your Reference 160M amplifier should normally require only minimal service such as periodic tube replacement to maintain its high level of performance.

Caution

Your Reference 160M 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. If you have additional questions regarding the operation, maintenance or servicing of your amplifier, please contact the Customer Support Department of Audio Research Corporation at service@audioresearch.com or call 763-577-9700. You may also initiate a service request by visiting the Audio Research website (www.audioresearch.com) and selecting 'Service Repair' at the top right of the home page.

Cleaning

To maintain the new appearance of this amplifier, occasionally wipe the front panel and top cover with a soft, damp (not wet) microfiber 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 paintbrush is effective in removing dust from bevels 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.

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. The warranty terms are also available on the internet at www.audioresearch.com/en-us/company/warranty-statement. 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.

Audio Research Corporation does not warrant compatibility of Audio Research products with future operating systems and/or hardware of other manufacturers.

Specifications

POWER OUTPUT: 140 watts continuous from 20Hz to 20kHz. 1kHz total harmonic distortion typically 1% at 140 watts, below 0.04% at 1 watt. (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 critical)

POWER BANDWIDTH: (-3dB points) 5Hz to 70kHz.

FREQUENCY RESPONSE: (-3dB points at 1 watt) 0.5Hz to 110 kHz.

INPUT SENSITIVITY: 2.4V RMS Balanced for rated output. (25.5 dB gain into 8 ohms)

INPUT IMPEDANCE: 200K ohms Balanced, 300K ohms Single Ended.

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

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

OUTPUT REGULATION: Approximately 0.6dB 16 OHM LOAD TO OPEN CIRCUIT (Damping factor approximately 14).

OVERALL NEGATIVE FEEDBACK: 14dB

SLEW RATE: 13 volts/microsecond

RISE TIME: 2.0 microseconds

POWER REQUIREMENTS: 105-130VAC 60Hz (210-250VAC 50Hz) 400 watts at rated output, 700 watts maximum, 260 watts at "idle", 1 watt off

TUBES REQUIRED: 2 matched pair KT150 (Power output V1-4); 2 6GH30 (Gain stage V5 and V6);

DIMENSIONS:

width 17.25" (43.8 cm)

height 10" (25.4 cm)

depth 18.5" (47 cm)

handles

extended 19.25" (48.9 cm)

WEIGHT: 56 lbs. (25.5 kg) Net; 73 lbs. (33.2 kg) Shipping



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