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# Owner's Manual

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## Model VT150

MONOBLOCK POWER AMPLIFIER

**audio research**  
HIGH DEFINITION®

5740 GREEN CIRCLE DRIVE / MINNETONKA, MINNESOTA 55343-4424 / PHONE 612/939-0600 FAX 612/939-0604

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## Introduction

Please take time to carefully read and understand the following information and instructions before you install or attempt to operate your Audio Research VT150 hybrid monoblock power amplifier. Becoming familiar with important facts about your amplifier and its correct operating procedures will help assure you of maximum musical satisfaction and reliable operation. The effort you invest now will be well rewarded as time goes by.

## Model VT150

The VT150 vacuum-tube monoblock audio power amplifiers provide an expression of the state-of-the-art in vacuum-tube technology as it exists today at Audio Research Corporation. The design objectives for this product were two-fold: 1) to provide an amplifier that would allow the improvements in musical accuracy of such products as the LS2, LS5, PH2, etc., to be fully realized, and 2) to provide an all-vacuum tube amplifier that would approach the reliability of good solid state amplifiers.

For this amplifier to become a possibility, it was necessary for quality vacuum tubes to be available. Fortunately, there is good news along that front. A very high quality version of the 6550 (which has always been ARC's tube of choice for power output) has become available from Russia. The tube is rugged, sonically superior to any other output tube previously available, doesn't arc, and has long life. ARC has evaluated this tube for several months prior to the development of the VT150, test running many of them for sonics and life expectancy. They continue to perform flawlessly for thousands of hours of use, maintaining good sonics throughout the period.

ARC's small tube of choice, the 6DJ8, is available in a Russian commercial/military equivalent type number 6922. This tube has also proven to be reliable and long lived.

The VT150 utilizes a 50% partially cathode coupled output circuit, with the screen grids driven by a separate multifilar winding in the output transformer. This method of output coupling provides several

benefits: 1) relatively high efficiency (55-65%) of power output, 2) four times lower than normal operating impedances, and 3) very tight coupling between primary halves of the output transformer and output stage. This method of coupling renders moot the age old discussion of triodes vs. pentodes. All the benefits of Class A Triode operation are present, but none of the disadvantages (i.e.: high heat, low power). Although the output stage actually runs Class AB1, because of the essentially 100% coupling between output stage halves, no switching transients are generated as would normally be expected from less than Class A operation. DC currents within the transformer are also essentially canceled by this circuit arrangement, thereby making much less critical the issue of exact DC balance between output tubes.

The VT150 amplifier uses fully balanced circuitry throughout, including ARC's patented cross-coupled technology. Other circuit enhancements include vacuum-tube electronic regulation of the power supply voltage for the output tube screen grids. Not only does this provide additional sonic improvement, but "warm-up" of the output tubes is slow and controlled, resulting in maximum life expectancy for these tubes. ARC's patented DEC (Decoupled Electrolytic Capacitor) technology is used, as well as the latest coaxial coupling capacitors. In short, the circuitry is both elegant and straight-forward, resulting in a audio amplifier of superior musical capability. Because of these many design features, together with its regulated power supplies, not only does the VT150 evidence a new reference for music reproduction, but also provides a perceived power much greater than it's sine wave power rating. What actually happens is that because of the extreme dynamic stability evidenced by this amplifier design, that it is "free" to "go" when large musical transients occur, unlike most other designs which tend to "choke" in the presence of large musical transients.

Finally, to complete this assault on the state-of-the-art, it was felt important that the VT150 be "user friendly". An adjustable electronically regulated output stage bias system is employed, together with monitoring of each of the 4 power output tubes via a



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meter on the front of the unit. Bias for output tube operating point is adjusted by a control in conjunction with the meter for one of the four tubes, (called the control tube), with the other three tubes automatically adjusted by DC servo circuits to "follow" the current of the control tube. A switch is provided so that each power output tube can be individually monitored. Should any tube not "follow" the current of the control tube, that tube is identified for replacement. (Note that because of the output stage topology, exact tracking of the DC currents of each output tube—although that is provided—is not critical for good sonic results.)

It should be expected that this amplifier will produce musically satisfying results for as long as you care to own it.

## Construction and Testing

Like every Audio Research product, your VT150 power amplifier has been designed and carefully handcrafted in the U.S.A., using precision mechanical parts, electronic components and assembly procedures similar to those used in the manufacture of scientific equipment and musical instruments. To assure consistent performance standards, each VT150 is visually inspected at several assembly points, test run, electronically tested and sonically evaluated prior to shipment.

This time-consuming perfectionist approach to the design and manufacture of audio equipment is intended to provide you with the best in musical satisfaction and lasting value.

## Packaging

Save all the packaging in a dry place. Your Audio Research amplifier is a precision electronic instrument and should be properly cartoned any time shipment is made. Because of its weight, it is highly probable that the unit will be damaged during shipment if repackaged in cartoning other than that designed for the unit.

You may not have occasion to return the unit to the factory for service, but if that should prove necessary or other occasion to ship it occurs, the original packaging may save your investment from unnecessary damage, delay and expense.

## Unpacking

The VT150 is packed within two cartons (inner and outer) which have impact-absorbing panels in between. Because of the weight of the unit and because it is a precision electronic instrument it is necessary to take reasonable care of its unpacking and preparation for use.

It is best to have a large, open work area with two persons available to help. Set the carton upright in the center of the work area and with a small knife carefully slit the taped edges of the outer carton's top flaps. Fold the flaps to the sides and while holding the inner carton in place, roll the unit upside down. You can now lift the outer carton off and set it and the filler panels aside. Now slit the inner carton's taped seams on the bottom (now facing upward). Again, fold the flaps over and while holding the unit in, roll it over as before. You can now lift the inner carton off to find your VT150 sitting upright, undamaged and uncartoned. Carefully remove the plastic wrap. Now, while you remember how, reassemble the carton system for future use.

## Accessories

1 – Phillips-head screwdriver for cover removal

User replaceable spare fuses include:

2 – 1/4 Amp AGC 250V normal-blow with 100V  
120V and 220/240V units

2 – 1/2 Amp AGC 250V normal-blow (All)

2 – 6 1/4 Amp MDX 125V slo-blow with 120V units

2 – 7 Amp MDX 125V slo-blow with 100V units

2 – 3 Amp MDQ 250V slo-blow with 220V/240V  
units

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## Warnings

1. To prevent fire or shock hazard, do not expose your VT150 to rain or moisture.
2. 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.
3. The 16-gauge, 3-conductor power cord on your VT150 is equipped with a standard 3-prong grounding plug. If used normally, it will provide a safe earth ground connection of the chassis. Refer to the section on "AC Power Connections" for detailed information.
4. For continued protection against fire hazard, replace fuses only with the same type and rating of fuses as specified.

## Preparation for Use

Your VT150 amplifier is shipped with the vacuum tubes packed in individual protective cartons. These must be unpacked and installed before you attempt to operate the amplifier. Proceed according to the following instructions.

1. Using the Phillips-head screwdriver provided, remove the top cover assembly, setting it and the retaining screws aside.
2. Carefully remove each vacuum tube from its carton and match its location number (written on the base of the tube and on its protective carton) to the number printed next to each socket on the circuit board. Firmly seat each tube in its matching socket, taking care to "key" the tube pins to the socket holds. Retain the tube cartons with other packing materials for possible future use.
3. Once all vacuum tubes have been installed, reposition the top cover assembly over the chassis and, re-install the screws.

**Note:** Contact Enhancers – such as the commercial preparation "Tweek" – are not recommended for use on vacuum tube contact pins. With continual exposure to heat and air, 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.



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## Panel Controls

The end panel with the meter has:

- 1 – Switch
- 1 – Meter
- 1 – Rotary bias adjustment control

## Use of Controls

The switch has five positions: 1) Operate, 2) V10, 3) V9, 4) V8, and 5) V7. In the "operate" position, the *meter* is inoperative. In the four other positions, one each of the power output tube "idle" currents is monitored, and the amplifiers' input is muted. It is recommended that the tubes be "biased" to operate within the 60-70 milliamperes range identified by the green area of the meter arc. Procedure: Turn the amplifier on and set the switch to the "V10" position. As the unit warms up, make a preliminary adjustment of the rotary bias adjustment control so that "V10" reads within the green portion of the arc. Rotate the switch through the V9, V8 and V7 positions to observe that each of these tubes is automatically adjusting to match V10. After 10 - 15 minutes, a fine adjustment can be made in the "V10" position, recheck V9, V8, and V7 to determine that they are tracking or following V10, and the switch can then be returned to the "operate" position. Note that it is not necessary to repeat this procedure each time the amplifier is turned on. It should be repeated occasionally, however, to determine that all power output tubes are operating normally. Should any tube fail to automatically adjust to the operating point set for V10, that tube is faulty, and should be replaced.

**POWER-ON SWITCH:** Initiates/terminates AC line power to the amplifier. Function indicated by green LED above toggle switch.

Note: Audio Research does *not* recommend leaving your VT150 "on" 24 hours a day as is the custom of some audiophiles to achieve maximum sonic performance on demand. While this is often recommended for solid-state equipment, Audio Research does not recommend this procedure for vacuum tube power amplifiers. (2,000 hours of tube life will pass by in 84 days!)

## Installation

To insure normal component life and safe operation this unit *must be operated only in a horizontal (upright) position*. Adequate air flow and proper cooling thereby can occur only if there is no restriction *below, behind and above* the unit.

The eight (8) special non-marring elastomer feet provide adequate spacing only from a smooth, hard surface. *Never operate the unit while it is sitting on a surface such as a rug or carpet.*

If the unit is to be operated in an enclosure such as an equipment rack, make certain that adequate air flow above and below the unit is provided. The "ambient" operating temperature should never exceed 120° F or 49° C. Audio Research Corporation Rack Mount Ventilators (RMV-3) must be used above and below each unit. 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.

## Panel Connections and Controls

The other end panel has:

- 1 – Power Cord
- 1 – Fuse Post
- 1 – Power On-Off Switch
- 1 – LED On Indicator
- 7 – Output binding posts for various output impedances
- 1 – XLR balanced input connector

## Connection and control instructions

The amplifier should always be turned on and off via its own power on-off switch. Because of the very high energy storage within this amplifier, special warm-up circuitry is provided which gets its sequencing from its own Power On-Off Switch. Fur-



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ther, other discrete components of an audio system should be turned on first. Otherwise, with some equipment, the amplifier will reproduce warm-up thumps, etc., some of which could be harmful to your speaker system. ARC preamplifiers have automatic warm-up muting, and are much less likely to exhibit this problem; however, good operating practice says *"Turn the amplifier on last, and turn it off first."*

The VT150 input is "balanced" and therefor requires a preamplifier with a balanced output, or, the addition of an ARC BL1 between a single-ended output preamplifier and the input of the VT150.

Pairs of ARC's proprietary and non-twisting output connectors are employed for each impedance. Simply observe the legend, connecting your speakers to the appropriate set of binding posts for their rated impedance. Connect the "negative" speaker lead to the "balanced" 4, 8 or 16 ohm (-) post; and the "positive" speaker lead to the (+) post directly above.

**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. For best results we recommend Audio Research LitzLink® interconnects and LitzLine® speaker cables.

Some loudspeakers, or some speaker switch boxes, have "common ground" systems, either by hookup between the speakers or in a special crossover device. Most headphone adaptor boxes also have a common ground. In these instances it is important to connect the "negative" speaker leads (or headphone common leads) to the "unbalanced, common-ground" post to avoid shorting the amplifier or causing monaural performance to occur. Use the unbalanced 4, 2 or 1 ohm post for the "positive" speaker leads. Contact your authorized Audio Research dealer or Audio Research Customer Service Department for help with these special cases.

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).

**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 VT150 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.

**AC POWER CONNECTIONS:** It is essential that the VT150 amplifier be connected to a wall AC power receptacle, or a similar heavy-duty source. If it is connected to convenience receptacles on preamplifiers, etc., the full sonic VT150 capabilities of both the VT150 and the preamplifier may be compromised. Furthermore, the proper control of start-up and shut-down surges may not occur unless the power switch on the front of the VT150 is actually used for on/off control of the amplifier. The AC power source for the VT150 amplifier should be capable of supplying 15 amperes for 100 or 120 volt units, or 8 amperes for 220 or 240 volt units.

For the very best performance on domestic 100 or 120 volt circuits, the VT150 should be connected to its own AC power circuit branch, protected by a 15 amp breaker. The preamplifier and other audio equipment should be connected to a different power circuit and breaker. If the power receptacle of the VT150 is more than 25 feet from the building power entrance and breaker box, it would be preferable to use installed wiring capable of 30 amperes to minimize voltage drop, using a 15 amp breaker. Avoid the use of extension cords. If they must be used on a temporary basis, use 14-gauge or heavier cords.

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The VT150 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 VT150 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 VT150 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 VT150 in the "Off" position before connecting the power line cord to AC power.



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## Operating and Adjustment Procedure

1. Make sure you have read and complied with the INSTALLATION AND CONNECTION instructions prior to attempting operation.
2. Make sure your VT150 is properly connected to a high-current power receptacle via the attached power cord (see CONNECTIONS).
3. Your preamplifier should be "On" and muted and/or set at minimum gain.
4. Turn the POWER switch "On" and set the meter switch to the "V10" position. As the unit warms up, make a preliminary adjustment of the rotary bias adjustment control so that "V10" reads within the green portion of the arc. Rotate the switch through the V9, V8 and V7 positions to observe that each of these tubes is automatically adjusting to match V10. After 10–15 minutes, a fine adjustment can be made in the "V10" position, then recheck V9, V8 and V7 to determine that they are tracking or following V10, and the switch can then be returned to the "operate" position. Note that it is not necessary to repeat this procedure each time the amplifier is turned on. It should be repeated occasionally, however, to determine that all power output tubes are operating normally. Should any tube fail to automatically adjust to the operating point set for V10, that tube is faulty, and should be replaced.
5. Your VT150 will now operate satisfactorily. However, a full stabilization or warm-up period of at least one-half (1/2) hour is recommended for best sonic performance.

## Servicing

Because of its careful design and exacting standards of manufacture, your VT150 amplifier should normally require only minimal service to maintain its high level of performance.

**CAUTION:** The VT150 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.

The vacuum tubes inside the VT150 are high-quality 6550, 12BH7, 12AX7 and 6922 types. Replacement output tubes should be matched for *best* sonic performance, although that is not a requirement for good sound. Any 6550 for positions V9, V8, or V7 that will "servo" to the DC operating point set for V10 should provide acceptable results. (The power output tubes supplied with your new VT150 are matched pairs of Russian 6550's) Reliable, Matched, low gas 6550 tubes – such as those available from ARC – are strongly recommended for maximum performance and longevity. Observe the operating and adjustment procedure for adjusting bias when replacing any power output tubes.

Additional questions regarding the operation, maintenance or servicing of your amplifier may be referred to the Customer Service Department of Audio Research Corporation: 612-939-0600. 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 visual appearance of your amplifier, occasionally wipe the front panel and top cover surfaces 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 "brushed" grain of the front panel finish.



# 3-Year Limited Warranty

## Terms and Conditions

### 1. LIMITED WARRANTY

Audio Research warrants the product designated herein to be free of manufacturing defects in material and workmanship, subject to the conditions hereinafter set forth, for a period of three (3) years from the date of purchase by the original purchaser or no later than five (5) years from the date of shipment to the authorized Audio Research dealer, whichever comes first, excepting vacuum tubes which are warranted for 90 days only (See 6).

### 2. CONDITIONS

This Warranty is subject to the following conditions and limitations. The Warranty is void and inapplicable if the product has been used or handled other than in accordance with the instructions in the owner's manual, abused, or misused, damaged by accident or neglect or in being transported, or the defect is due to the product being repaired or tampered with by anyone other than Audio Research or an authorized Audio Research repair center. The product must be packed and returned to Audio Research or an authorized Audio Research repair center by the customer at his or her sole expense. Audio Research will pay return freight of its choice. A RETURNED PRODUCT MUST BE ACCOMPANIED BY A WRITTEN DESCRIPTION OF THE DEFECT AND A PHOTOCOPY OF THE ORIGINAL PURCHASE RECEIPT. This receipt must clearly list model and serial number, the date of purchase, the name and address of the purchaser and authorized dealer and the price paid by the purchaser. Audio Research reserves the right to modify the design of any product without obligation to purchasers of previously manufactured products and to change the prices or specifications of any product without notice or obligation to any person.

### 3. REMEDY

In the event the above product fails to meet the above Warranty and the above conditions have been met, the purchaser's sole remedy under this Limited Warranty shall be to return the product to Audio Research or an authorized Audio Research repair center where the defect will be rectified without charge for parts or labor, except vacuum tubes (See 6).

### 4. LIMITED TO ORIGINAL PURCHASER

This Warranty is for the sole benefit of the original purchaser of the covered product and shall not be transferred to a subsequent purchaser of the product.

### 5. DURATION OF WARRANTY

This Warranty expires on the third anniversary of the date of purchase or no later than the fifth anniversary of the date of shipment to the authorized Audio Research dealer, whichever comes first.

### 6. VACUUM TUBES

Vacuum tubes are warranted for the original 90-day period only.

### 7. DEMONSTRATION EQUIPMENT

Equipment used by an authorized dealer for demonstration purposes is warranted to be free of manufacturing defects in materials and workmanship for a period of three (3) years from the date of shipment to the dealer. Vacuum tubes are warranted for 90 days. After the first year, demo equipment needing warranty service must be packed and returned to Audio Research by the dealer at his sole expense. Audio Research will pay return freight of its choice. A returned product must be accompanied by a written description of the defect on an AUDIO RESEARCH RETURNED GOODS AUTHORIZATION form. Dealer-owned demonstration equipment sold at retail within three (3) years of date of shipment to the dealer is warranted to the first retail customer to be free of manufacturing defects in materials and workmanship for the duration of the 3-Year Limited Warranty remaining (as measured from the date of shipment of the equipment to the dealer). Vacuum tubes are not warranted for any period under these conditions of sale. In the event warranty service is needed under these conditions, the owner of the equipment must provide a copy of his purchase receipt, fulfilling the requirements described under "2. Conditions" above. The product must be packed and returned to Audio Research or an authorized Audio Research repair center by the customer at his or her sole expense. Audio Research will pay return freight of its choice.

### 8. MISCELLANEOUS

ANY IMPLIED WARRANTIES RELATING TO THE ABOVE PRODUCT SHALL BE LIMITED TO THE DURATION OF THIS WARRANTY. THE WARRANTY DOES NOT EXTEND TO ANY INCIDENTAL OR CONSEQUENTIAL COSTS OR DAMAGES TO THE PURCHASER. Some states do not allow limitations on how long an implied warranty lasts or an exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### 9. WARRANTOR

Inquiries regarding the above Limited Warranty may be sent to the following address:

#### Audio Research

5740 Green Circle Drive, Minnetonka, Minnesota 55343-4424.  
ATTN: Customer Services

## Warranty Outside the U.S.A.

Audio Research has authorized distribution in many countries of the world. In each country, the authorized importing retailer or distributor has accepted the responsibility for warranty of our products. Warranty service should normally be obtained from the importing retailer or distributor from whom you purchased your product.

In the unlikely event of service required beyond the capability of the importer, Audio Research will fulfill the conditions of the warranty. Such product must be returned at the owner's expense to the Audio Research factory, together with a photocopy of the bill of sale for that product, a detailed description of the problem, and any information necessary for return shipment.



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# Specification

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## Model VT150

**POWER OUTPUT:** 130 watts continuous at 16 ohms from 20Hz to 20kHz with less than 1.0% total harmonic distortion (typically below .05% at 1 watt).

Approximate actual power available at "clipping" 145 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) 12Hz to 80kHz.

**FREQUENCY RESPONSE:** (-3dB Points at 1 watt) 2Hz to 200 kHz.

**INPUT SENSITIVITY:** 2.3V RMS balanced for rated output.

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

**OUTPUT REGULATION:** Approximately 0.5dB 16 ohm load to open circuit (Damping factor approximately 16).

**OVERALL NEGATIVE FEEDBACK:** 15dB.

**SLEW RATE:** 17 volts/microsecond.

**RISE TIME:** 2.0 microseconds.

**HUM & NOISE:** Less than 0.5mV RMS – 98dB below rated output (IHF weighted, input shorted).

**POWER SUPPLY ENERGY STORAGE:** Approximately, 420 joules.

**POWER REQUIREMENTS:** 110-125VAC 60Hz (220-250VAC 50Hz) 470 watts at rated output, 600 watts maximum, 290 watts at "idle".

**TUBES REQUIRED:** 2 – Matched pair 6550 – Power Output; 2 – 6550 Regulators; 1 – 12AX7 Regulator Amplifier; 4 – 12BH7A Driver; 2 – 6922 input.

**DIMENSIONS:** 14 1/2" (37 cm) W x 12" (30.5cm) H x 22" (56 cm) D. Knobs extend 5/8" (1.6 cm) forward. Output connectors extend 1" (2.5 cm) to the rear.

**WEIGHT:** 62 lbs. (28.2 kg) Net; 82 lbs. (37.3 kg) Shipping.

Specifications subject to change without notice.

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