

Thank you for selecting the CAV50 as the control amplifier for your audio system. The first control amplifier (integrated amplifier) from conrad-johnson, the CAV50 benefits from more than two decades of building among the finest audio amplifiers and preamplifiers in the world. It demonstrates the same remarkable ability to recreate the dynamics, textures, tonalities, and ambience of live musical performances for which conrad-johnson products are known. With the CAV50, we believe that you will experience the excitement of discovery in hearing more from your favorite recordings than ever before.

At conrad-johnson, we expect our products to be a source of satisfaction and pride to their owners for many years to come. Accordingly, circuit designs, parts and materials for all conrad-johnson products are selected with a view to maintaining optimal performance over the years. Our reputation for producing among the industry's most reliable components is a natural consequence of this engineering approach.

Although operation of the CAV50 is quite straightforward, please take a few minutes to read this manual for useful information on it's installation and operation.

In closing, we'd like to welcome you to the family of conrad-johnson owners. We want you to enjoy your conrad-johnson product to the fullest. To this end, our staff stands ready to answer any questions you may have about the function and application of your CAV50, and to provide any needed service both during, and after the warranty period. Our goal is to heighten your enjoyment of recorded music.

Limited Warranty For Conrad-Johnson Components

conrad-johnson design, inc. will provide service under warranty to the original owner on products sold new in the United States for the lesser period of three years from the date of purchase by the original purchaser, or five years from the date of shipment to the authorized conrad-johnson dealer. During the warranty period, conrad-johnson will repair defective units without charge for labor or parts (with the exception of vacuum tubes and batteries).

Exclusions. The following are not covered under this warranty:

- a) Units which have been damaged by misuse, abuse, or accident.
- b) Units which have been modified, altered, or improperly repaired by anyone not specifically authorized by conrad-johnson design, inc.
- c) Units not purchased from an authorized conrad-johnson dealer in the United States for use in the United States.
- d) Normal wear.
- e) Incidental or consequential damages are not covered under this warranty. Some states do not allow the exclusion of incidental or consequential damages, so this exclusion may not apply to you.

Obtaining Warranty Service: To obtain warranty service, the unit must be shipped, along with evidence of purchase, in factory packing to conrad-johnson design (or designated service center) with freight and insurance prepaid by the owner. After repair, the unit will be returned with freight and insurance prepaid by conrad-johnson design to any destination in the United States.

All implied warranties, including merchantability and fitness for a particular purpose are limited in duration to the duration of this express warranty. Some states do not allow limitations on the duration of implied warranties so the above limitations 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.

Conrad-Johnson products purchased outside the United States are covered by warranty terms of the importing distributor in the country in which the product was originally purchased, which may differ from the terms set out herein. Importing distributors are not obligated to provide warranty service for products originally purchased outside their country. Conrad-Johnson will provide warranty service for products outside the

United States, but the customer must pay all shipping, handling and customs costs both to and from our Service Department.

Questions about this warranty should be addressed to:

Service Department
conrad-johnson design, inc.
2733 Merrilee Drive
Fairfax, VA 22031

The Service Department can also be reached by phone at 703-698-8581, or by fax at 703-560-5360

Service

If your conrad-johnson audio component requires service, repack it using the original box and packing material and ship to the Service Department address above. Boxes and packing materials can be obtained from our service department for a nominal charge if you no longer have yours. Include with the unit a note describing the problem you are having in as much detail as possible. It is especially important for our technician to know if the problem is intermittent. If you want an estimate of cost for out of warranty service, be sure to request it in this note. Be aware that requesting an estimate will delay service to your unit as we will have to contact you for your approval before commencing service.

Registering The Warranty

Please return the enclosed card to the factory within 30 days of purchase to register the warranty.

Circuit Design

The CAV50 circuit is notable for its elegant simplicity. A passive control unit selects among inputs, and sets the signal level. The selected signal is routed to a triode input amplifier comprised of paralleled sections of a 12AX7A which is direct coupled to a cathode coupled differential phase inverter using high current triodes to provide balanced, low impedance drive to the push-pull output stage. The output stage features ultralinear operation of a pair of EL34s, which permits relatively high power levels while greatly reducing the source impedance of the stage. As a result, the amplifier is capable of supplying the large current demands of high amplitude musical transients driven into reactive speaker loads. A substantial main power supply of massive polypropylene capacitors enables the CAV50 to easily meet these extraordinary current demands. A single stage triode amplifier provides gain and a buffered preamp output for use with a secondary amplifier or powered subwoofer.

Voltage regulators for the voltage amplifiers and phase inverters provide nearly absolute isolation of these sensitive stages from the output stages.

Optionally, the CAV50 may be reconnected internally for triode operation of the output stage, for exceptionally musical performance, but at considerably reduced output power. The conversion is simple, but does require soldering. Consult your dealer as to which configuration will perform best in your system.

***I*nstallation**

As is the case with any vacuum-tube power amplifier, the CAV50 dissipates a significant amount of heat. Provision must be made for adequate ventilation. Mount the unit on a flat, hard surface, taking care that the ventilation holes in the bottom are unobstructed. Maintain at least four inches of clearance above the unit, and at least three inches on the sides. The cabinet or shelf should be open at both front and back. For more restricted installations, cooling fans are essential.

The CAV50 is supplied with a cover for the vacuum-tubes, which can be secured by the four captive screws inside the cover. The cover provides protection from the hot surfaces of the vacuum-tubes. It should always be used in installations where there is any possibility that children or pets may come near the amplifier.

All CAV50s sold in the United States are configured for operation on a 60Hz ac power line producing between 108 and 126 volts. Export versions of the CAV50 will have the correct operating voltage and frequency clearly marked on the back panel of the unit, near the ac power cord. In all cases, the actual line voltage should be within + 5/-10% of the nominal rated voltage.

Electromagnetic Interference (EMI)

Considerable care has been taken in the design of the CAV50 to minimize its susceptibility to radio frequency interference and other forms of EMI. Choice of materials, physical layout, grounding practice, and power supply design have all been specified with a view to reducing the impact of electromagnetic fields on the performance of this unit. At the same time, however, our primary goal is the accurate reproduction of recorded music in the normal home environment, and we have elected not to compromise this objective by the application of heavy-handed RFI filters, or by using grounding practices that reduce RFI at the expense of degraded audio performance. We find that the approach we have taken has worked extremely well, resulting in only rare instances of EMI problems which could be treated locally as needed, rather than compromising the performance of our product in the 99.9% of installations where EMI is not a problem.

Care in installation can often avoid EMI induced problems. The following practices should generally be observed in any application, and will be especially important where EMI may be a problem.

Interconnect cables should be kept as short as possible (3 meters or less), and shielded cable should be used (cable which has two center conductors, and a separate external shield connected at only one end).

Physical location and cable "dress" can be an important factor in minimizing hum pickup. The installation should situate the preamplifier well away from the power amplifier, and power (ac mains) cords should be dressed to remain at least 4" (100mm) away from input/output cables.

Connection

PH/AUX1, TUNER, CD, VIDEO, AUX2, EPL IN: These are high level inputs and are electrically equivalent. They present a 50k ohm load to the source. EPL stands for "external processor loop". If used, the *outputs* of a tape recorder or external processor (eg. equalizer) should be connected to "EPL IN".

EPL OUT: This output connects the selected signal to your recorder or external processor. The output signal is not affected by the level control. Connect "EPL OUT" to the *inputs* of your tape recorder or external processor.

PRE OUT: Connect this output to the input of a secondary amplifier, or crossover, or powered subwoofer in a bi-amped system. We recommend the use of an amplifier with an input impedance of 50k ohms or higher. Since the pre out of the CAV50 inverts phase, it may be necessary to invert the speaker leads to maintain correct phase. See the section on "Getting the most out of your CAV50" for an explanation of this.

EXTERNAL TONE CONTROLS OR OTHER SIGNAL PROCESSING DEVICES: Connect the output from your processor to the EPL IN input, and the input of your processor to the EPL OUT output on the CAV50. Depressing the EPL switch to the "in" position will insert the processor into the circuit; releasing it to the "out" position will provide flat, unprocessed response.

RIGHT, LEFT: Binding posts are provided for connection of your loudspeakers. The two channels should be connected in correct "relative phase". This means that when the same signal is applied to both channels, the right and left channels speaker diaphragms will move synchronously - in and out together.

Terminals on speakers are usually coded - one designated "C", "ground", "-" or black, the other designated "+" or red. "In phase" connection of the speakers can normally be achieved by taking care to connect the wire from the "+" amplifier terminal to the red or "+" coded terminal on each speaker, and connecting the "-" terminal to the black or "-" coded terminal on each speaker.

In phase connection of the speakers can be readily ascertained by ear. Listen to a recording of a solo vocalist (use a mono recording if available). With the speakers in phase the voice should be clearly focused between the two speakers. With the speakers connected out of phase, the voice will be diffused, with no identifiable source. Relative phase may be reversed by switching the "+" and "-" leads at one speaker only.

Controls

power: This switch turns the amplifier on and off. Because of the delayed warmup characteristics of vacuum tube equipment, a time delay muting circuit is incorporated in the CAV50 to mute the preamplifier output (PRE OUT) at turn-on and turn-off. The PRE OUT connections are grounded via a relay for approximately 90 seconds after the unit is turned on in order to suppress warm-up transient noises. The relay grounds these outputs again immediately at turn off or in the event of any power line interruption.

selector: This switch is used to choose among AUX1/PHONO, TUNER, CD, VIDEO, and AUX2 inputs. The selected source is routed to the EPL OUT connection. When the EPL switch is in the out (source) position the selected source will also be sent to the PRE OUT connections, and to the speaker (RIGHT and LEFT) connections.

epl: Tape monitoring, and selection of an external processor is accomplished via a pushbutton control. The button, labeled epl, when depressed selects your tape deck or external processor as an input source.

volume: The CAV50 volume control is a precise control, maintaining channel to channel accuracy to within 1 dB throughout most of its rotation.

***G*etting The Most From Your CAV50**

When combined with comparably high quality source (such as the conrad-johnson DV2b cd player) and speakers, the CAV50 offers a high level of sophistication and refinement in music reproduction. To get the best performance out of any audio system, there are a number of important details which must be attended to.

Absolute Phase

Musical notes are heard through the ear's response to waves of alternating rise and fall of air pressure. Musical transients are almost exclusively positive: that is, the initial effect is a rise in pressure. The ear is capable of distinguishing these positive transients from the musically unnatural alternative of a negative transient (an initial fall in air pressure). In terms of your stereo system, these transients are created by your loudspeakers. If the speakers respond to musical transients by first moving out, they are creating a rise in pressure, and the system is said to be phase correct. If they respond by moving in, they create a fall in pressure and the system is said to be phase inverting. Each component in the stereo system either preserves the phase of the incoming signal, and is said to be phase correct, or inverts the phase and is said to be phase inverting. It is unimportant whether an individual component is phase correct or phase inverting, as long as the system as a whole is phase correct. This will be the case if the number of phase inversions is even (or zero).

The speaker outputs (RIGHT and LEFT) of the CAV50 are phase correct.

The preamplifier outputs of the CAV50 are phase inverting. If this part of your system has an odd number of inversions (as will be the case if the CAV50 preamplifier section is the only inverting component), then you must add one phase inversion *in this part of the system*. This is conveniently done by reversing the positive and negative connections to the speakers or subwoofers connected through the PRE OUT path (be sure to reverse both channels).

If you are not sure about the phase of every piece in your system, you can establish correct absolute phase by careful listening. When the system is in correct phase, transients will be noticeably cleaner and

more sharply defined. The effect is especially apparent on plucked string sounds. A final warning - not all recordings are phase correct (including some "audiophile" recordings), so listen to several before concluding your investigation of absolute phase.

The Importance Of Wires

Interconnect and speaker wires are an important element in your stereo system. Interconnects are available which will permit a reference quality system to blossom and fulfill its promise of musical reality. Others will strangle the system to the point where it becomes little better than average. To complicate matters, our experience suggests that the choice of interconnects will be system dependent - those that are top ranked on one system may be a poor choice for a different system. Consult your conrad-johnson dealer for recommendations for your specific system.

Questions: If you have questions about the installation or function of your CAV50 do not hesitate to call Customer Service at (703) 698-8581.

***T*ube Replacements**

The CAV50 uses nine vacuum tubes of four different types: two 12AX7A (V1 and V2), two 6SN7 (V3 and V4), one 12AU7 (V9) and four EL34s (V5 through V8). The brands of tubes we supply have been chosen by first selecting those brands which are known to be most reliable, then by extensive auditioning of these acceptable brands with the final choices being made solely on the basis of sonic performance. We know of no vacuum tubes available which will improve the sonic performance of your CAV50. We highly recommend that you purchase replacement tube sets from conrad- johnson design.

We anticipate tube life to accomodate two to three years of operation without degradation in normal use - if the amplifier is switched off when not in use. If it is left on at all times, tube life can be exhausted in a matter of a few months.

The CAV50 has been designed to make tube replacement as simple as possible. Because the output tubes are individually biased, replacement tubes need not be matched pairs. No a-c balance adjustment is necessary. It is necessary to re-bias the amplifier when the output tubes are replaced. The CAV50 has built in bias indicators so that no instruments are required to make this adjustment.

Adjusting Output Tube Bias

Biasing the amplifier is a simple procedure that can easily be done by the owner. Only a plastic screwdriver is required. A plastic screwdriver has been included with your amplifier for this purpose. After replacing the tubes, the amplifier should be connected to a load (your loudspeakers will work fine) and there should be no signal applied to the amp. It should be connected to you preamplifier with the volume control turned fully down. Turn the amplifier on. After about one minute, turn each of the four screwdriver adjustable controls counterclockwise until the associated indicator LED just goes off. Clockwise rotation may be necessary first to turn the LED on; do not turn the adjusting screw any further in the clockwise direction once the LED has come on.

After the amplifier has warmed up thirty minutes, the procedure just described should be repeated. NOTE: It is normal for these LEDs to flash or flicker when the amplifier is in use.

This biasing procedure should be performed whenever the amplifier's output tubes are replaced and after each six months of average use.

PLATE FUSE: Your CAV50 has been fitted with plate supply fuses which are designed to protect the amplifier circuitry in the event of output tube failure. The fuse holders are physically located on top of the chassis near output tubes V5 and V6. The cap unscrews counter clockwise to remove the fuse (a BUSS BBS-3/4). An LED near the fuse holder will light when the fuse is blown.

What happens when the fuse blows? If one of these fuses should blow, it usually indicates a marginal output tube (one of two for each channel) and an attempt should be made to identify and replace it, by either (a) replacing the fuse and turning on the amp while watching the output tubes carefully; look for a bright white or blue flash inside the tube. If nothing happens, then (b) lightly tap the output tubes one by one with the plastic handle of a screwdriver while watching for flashes inside the tube. If efforts to identify the bad tube fail, the best course of action is to replace both tubes in the channel that blew the fuse. If the tubes are over two years old, or have more than 1,500 hours on them, a complete replacement tube set is probably in order.

The sonic effects of a blown fuse are very low, very distorted sounds from the speaker being driven by that channel.

TO AVOID SHOCK, ALWAYS TURN OFF THE AMPLIFIER BEFORE REMOVING THE FUSE HOLDER CAP.

Replacement fuses are available from conrad-johnson dealers.

Specifications:

Power (ultralinear operation): 45 watts per channel RMS both channels driven into 8 ohms from 30Hz to 15KHz at no more than 1% total harmonic distortion or intermodulation distortion.

Power (triode operation): 22 watts per channel RMS both channels driven into 8 ohms from 30Hz to 15KHz at no more than 1.5% total harmonic distortion or intermodulation distortion.

Sensitivity: 500 mv to full power.

Gain to PRE OUT: 20 dB

Phase (speaker outputs): Phase correct (non-inverting)

Phase (PRE OUT): Phase inverting

Frequency response: 20Hz to 20KHz +0, -.5dB

Hum and noise: 98dB below full power output.

Hum and noise (PRE OUT): 94 dB below 2.5V output

Distortion (PRE OUT): less than .1% THD or IMD

Dimensions: 14D x 17.5W x 7.25H inches.

Weight: 44 lbs.

Internal Fuses

The CAV50 power transformer is protected by a fuse on the ac power line (F1) and by a separate fuse (F2) for the secondary windings for the filament supply. Both fuses are located on the printed circuit board inside the chassis. A failure of either of these fuses is a symptom of a more serious problem, and a competent service technician should be consulted. ***In no event should fuses be replaced with a value or type different than that originally supplied.*** The correct fuse values and types are:

F1: 5 amp, slow blow If configured for 100 or 120V:

3 amp, slow blow if configured for 220 or 240V.

F2: 4 amp, slow blow