

# **CAD-1610-SE**

## **OPERATING MANUAL**

**NOTE:**

Before installing your new CAD-1610-SE, please read this manual carefully as it will inform you of the CAD-1610-SE's specifications, proper installation and operation procedures. Also included in this manual are guidelines on how to properly service and care for your new CAD-1610-SE.

# ***CAD-1610-SE***

## ***SINGLE-ENDED MONO-BLOCS***

The new CAD-1610-SE single-ended triode mono-blocs are equipped with the new KR Enterprises T-1610 triode tube. This vacuum tube has been specifically engineered and manufactured for the Cary Audio Design CAD-1610-SE amplifiers. By all indications, this tube will last up to five years or more in the Cary Audio mono-bloc amplifiers. The basic design of the new CAD-1610-SE is a time proven circuit used in many of the Cary Audio triode single-ended designs. These circuit topologies contribute to incredible reliability and enjoyment.

For the technically minded, a review of the circuit is in order. The new CAD-1610-SE mono-blocs operate in pure class A single-ended. The output stage features the new T-1610, low-mu audio power triode. The T-1610 low-mu design allows for very low distortion in single-ended designs. The CAD-1610-SE amplifiers have two special high and low impedance bias supplies. There is no need to ever worry if the lower amplifier section that contains the T-1610 triode tube is inadvertently turned on without the bias voltage supplied from the top 300B section. There is a high impedance bias supply that automatically controls the T-1610 plate current. The actual operating bias is supplied from the driver section (top unit) to the T-1610 vacuum tube. The output power of the CAD-1610-SE amplifier is over 100 watts peak envelope power. The steady state continuous sin wave power is 55 watts into either an 8 or 4 ohm load. The class of operation is pure class A single-ended. The output transformer in the new CAD-1610-SE is an air gap design with full bias running on a continual basis. The output transformer in the CAD-1610-SE is the most important component in the amplifier and has been specifically designed by Cary Audio Design for use in the CAD-1610's. We have taken the approach in the output transformer design the use oxygen free copper wire. The primary and secondary windings on portions of the output transformer are wound in a bi-filer process with the two inductors interleaving twenty six times. The bi-filer wind (two conductors wound at the same time) will yield the closest balance and coupling of any design currently utilized in vacuum tube output transformers. The E/I laminents used in the special output transformers on the CAD-1610-SE's are silicone impregnated hipersil steel contributing to the extremely low loss and a seductive midrange. The above process is similar to the single-ended design air-gap transformers found on all the Cary single-ended output transformers.

An audio drive signal is applied to the control grid of the input 6SN7 dual triode tube. The second 6SN7 triode is functioning as a anode current device supplying operating voltage and current to the first 6SN7 triode gain stage. After the signal is amplified by the 6SN7 the output anode of this section is directly coupled to the grid of the 300B triode gain stage. The direct coupling eliminates the need for a

coupling capacitor along with supplying bias for the 300B tube. The 300B gain stage is supplied voltage on the anode by a high inductance voltage choke. This choke takes the place of a conventional resistor used in most amplifiers. The choke allows the 300B to swing a much greater amount of amplified AC audio signal to the output T-1610 tube. The amplified signal from the 300B triode is coupled through an oil filled .22 at 600 VDC capacitor to the grid of a dual section low mu 6BL7 triode. The 6BL7 performs two functions. One is to provide the proper low impedance bias voltage to the T-1610 output tube. The other function is to couple the amplified AC audio signal directly to the control grid of the T-1610 output triode. The T-1610 output tube is fed B plus voltage through the air gapped output transformer.

The power supply in the CAD-1610-SE's actually consists of eight different supplies. The power transformers are designed to operate at a 200% continuous commercial service at the full rated output power. The high voltage power supply section for the T-1610 output tube is a full wave center tap configuration (not some cheap voltage doubler as used in many competitors amps) to a PI network. All filament voltages in the CAD-1610-SE amplifier are DC. The DC filament supplies will prevent AC ripple from capacitively being coupled to the electrodes of the input and output tubes.

A great deal of attention during design of the new CAD-1610-SE's was concentrated on the "overload recovery" ability of the amplifier. The ability of an amplifier to instantly recover from clipping is much more important than is commonly believed. In the power war of amplifier manufacture's, the mentality is focused on high and then even higher power output to solve the clipping problem. When in reality the most critical aspect is how fast a recovery an amplifier can achieve after overload. With the incredible dynamic range of live and in turn recorded music, even 2,000 watts of power is not enough. Most of the music being listened to in an average home listening room is only requiring about 3 watts of power. It is on the transients of loud low frequency program material that tremendous signal voltages will appear at the input of the amplifier. It is in this situation that the overload recovery ability of an amplifier is of critical concern. The CAD-1610-SE extols its merits in the ability to handle transients and instantaneously recover from brief or even extended over loads. The CAD-1610-SE's will overload symmetrically at any frequency in the audio bandpass.

The CAD-1610-SE will also yield faithful reproduction of extremely low frequencies at full output levels. Power transformer, power supply regulation and output transformer design and careful shaping of the overall frequency response curve all play a very important part in the ability of the CAD-1610-SE to recover quickly when over loaded. If one were to monitor the high voltage rail voltage (550 VDC) at the anode to cathode of the T-1610 output tube during soft and also

loud music passages it would be found there is no more than a volt or so change from soft to loud passages.

Another technical feature of the new CAD-1610-SE amplifier is stability. The CAD-1610-SE's may be operated with no load (without speaker) without damage to the amplifier, output transformer or tubes.

The CAD-1610-SE mono amplifiers are built from machined aluminum on all parts of the structure. The amplifiers are built to perform year after year with trouble free operation. The CAD-1610-SE's are a classic example of the "CARY" sound.

**Model:**

**CAD-1610-SE**

**Serial Number:**

---

---

The operation of the CAD-1610-SE mono block amplifier is a simple procedure since each unit is designed for long term stability in virtually any home operating situation. Therefore, if the unit is operated outside the parameters outlined in the Operating Manual, damage may result. Please read the Operating Manual carefully before operating the CAD-1610-SE amplifier.

### CAUTION TERMS

When the following cautionary terms are used in this manual, these definitions apply:

<b>WARNING:</b>	<b>Electrical hazard! Misuse or failure to follow instructions properly may result in personal injury or death!</b>
<b>CAUTION:</b>	<b>No risk or personal injury; however, misuse or failure to follow instructions may result in damage to equipment.</b>
<b>NOTE:</b>	<b>No risk of personal injury or equipment damage; however, misuse or failure to follow instructions may prevent proper performance to the equipment.</b>

### SPECIFICATIONS

This section describes the basic specifications of the CAD-1610-SE at the time of printing. Specifications are subject to change without notice or obligation.

<b>WEIGHT</b>	<b>: 130 lbs.</b>
<b>DIMENSIONS</b>	<b>: 22-1/2”H x 13-1/2”W x 18-1/2”D</b>
<b>CIRCUIT TYPE</b>	<b>: Class A Single-Ended, Shunt Feed</b>
<b>POWER OUTPUT</b>	<b>: 55 watts RMS (Steady State Continuous) : 100 watts PEP (Peak Envelope Power)</b>
<b>INPUT SENSITIVITY</b>	<b>: 2 Volt for Full Output</b>
<b>NOISE AND HUM</b>	<b>: -85 dB below Full Output</b>
<b>FREQUENCY RESPONSE</b>	<b>: 15 Hz-23khz +/- .75 dB</b>
<b>POWER TRANSFORMER</b>	<b>: 200% Duty Cycle EI Laminate - 8 separate supplies</b>

<b>TUBES</b>	<b>: 1 - KR-1610 output 2 - 6SN7 input 2 - 6BL7 driver 2 - 5R4 rectifier 1 - WE 300B driver</b>
<b>OUTPUT TRANSFORMER</b>	<b>: 200% Duty Cycle 100 watt special custom design for 1610 tube</b>
<b>RESISTORS</b>	<b>: 1% Metal Film</b>
<b>CAPACITORS</b>	<b>: Oil Filled Coupling</b>
<b>FILTER CHOKES</b>	<b>: EI Laminate PI-L Configuration</b>
<b>POWER SUPPLY CAPACITORS</b>	<b>: 12 ea. 1200uF @ 450V</b>
<b>AC CORD</b>	<b>: IEC Detachable</b>
<b>AC POWER REQUIREMENTS</b>	<b>: 117/234 Volts</b>
<b>CONSUMPTION</b>	<b>: 120 watts - Stand-by 400 watts - Operate</b>
<b>BREAK-IN TIME</b>	<b>: 100 hours</b>
<b>FINISH</b>	<b>: Black Epoxy Coated Machined Aluminum Chassis, Clear Anodized Machined</b>
<b>Aluminum</b>	<b>Face Plate &amp; Knobs</b>

## **FRONT PANEL FEATURES**



## **REAR APRON FEATURES**

## **CAD-1610-SE PLACEMENT**

The CAD-1610-SE is designed for use inside homes. It must be protected from the elements and temperature extremes. For example, avoid placing the amplifier in extremely hot locations such as near radiators or other heating units. Its location among the user's audio components is not critical; however, certain precautions must be taken.

## **POWER REQUIREMENTS**

The CAD-1610-SE is designed to operate from house current mains. The design voltage is 117 VAC at 50/60Hz (Foreign units 234 VAC at 50/60Hz).

## **CABLES**

The speaker cables from the output posts of the CAD-1610-SE to the speaker system can be any convenient length your set-up requires. Select speaker cables of sufficient size to preserve the outstanding performance capabilities of your CAD-1610-SE. Heavy gauge #16 wire is suitable for distances up to 10 feet; #12 for 25 feet. Most audio dealers will have proper speaker cable in stock for this purpose. See Initial Setup Instructions (opposite page) for Speaker Out.

## **INTERCONNECTS**

Signal input connect is made via the input jack on the rear of the CAD-1610-SE. See Initial Setup Instructions (opposite page) for Interconnect input. The interconnect cables from the output of the preamplifier can be any convenient length your set-up requires. The choice of a high quality interconnect cable is important. Once again, your audio dealer will have the proper cables in stock for this purpose.

## **WARRANTY CARD**

If you were the original purchaser of this amplifier and it was purchased in the United States, the enclosed warranty registration card should be completed and returned to Cary Audio Design within 10 days of the purchase. Cary Audio Design also suggests that the original packing cartons be maintained in the event it is necessary to ship the amplifiers at a later date. Warranty restrictions apply. Consult the warranty section of this Operating Manual for details.

## **BREAK IN PERIOD**

The tubes, capacitors and output transformers take approximately 100 hours of music playing to fully settle in for peak performance. The CAD-1610-SE may seem sterile or thin sounding out of the box. After the first couple of hours, you will notice increased depth and tighter bass. This break in period defies all engineering theory, but is true with most audio amplifiers.

## **SERVICE AND CARE**

The CAD-1610-SE chassis may be cleaned with a soft towel and Windex® (or a similar window cleaner). The frequency of cleaning will be governed by the number of hours the CAD-1610-SE is operated and by operating environmental cleanliness.

## FACTORY SERVICE

Careful consideration has been given to the design of your CAD-1610-SE to keep maintenance problems to a minimum; however, it is possible that some problems may arise which cannot be cured by tube substitution. After reading the Troubleshooting Guide at the end of this manual, we suggest that you contact our Customer Service Department at phone number (919) 481-4494 to describe your problem in detail. **Do not return the CAD-1610-SE to the factory without a Return Authorization Number from the Customer Service Department.** Cary Audio Design will assume no responsibility if the transportation company refuses to pay damage claim due to your improper packing or lack of insurance should the unit be lost in shipment.

## NON-WARRANTY REPAIRS

Cary Audio Design will provide repair service for its products charging on a time and expense basis for the repairs.

### **WARNINGS**

**Make no attempt to put the CAD-1610-SE in service outside of the cabinet - Contact with high voltages found in the unit can be fatal!!!**

**Completely remove AC power plug from the wall and allow 30 minutes for the high voltage capacitors to discharge through bleeder resistors before attempting to change tubes or clean the inside of the amplifier.**

### **CAUTIONS**

**Never remove/insert AC plug when the unit is on or the AC power switch is in the "ON" position**

**Obstruction of the top portion of the CAD-1610-SE will result in tubes overheating**

## PROPRIETARY RIGHTS

Cary Audio Design has proprietary right in the design and components of its products. While the purchaser is entitled to use the product for its intended purpose, use of the products for its intended purpose, use of the product for copying, imitation, or reverse engineering is a violation of these proprietary rights and is forbidden.

# CAD-1610-SE TROUBLESHOOTING GUIDE

SYMPTOM	CAUSE	REMEDY
Hum or “Buzzing” through speakers	-Ground loop  -T1610 tube with high plate current  -Intermittent or poor connection of interconnect ground	-Install 2-pin adapter on A.C. cord to float the ground.  -Check bias of T1610. If high, readjust to proper bias setting.  -Replace interconnect
“Popping” or “Spitting” noise channel, through the speaker	-Noisy tube	-If noise is in one swap one section of tubes at a time until the noise swaps channels. Replace noisy tube.  -Check bias of output tube. If high or fluctuating rapidly, swap 6BL7 tubes to see if it swaps channels.
AC fuse blows check	-Line voltage surge	-Replace fuse and  T1610 bias current
Tube fuse blows	-Shorted tube (T1610)	-Replace fuse first, then if tube is shorted replace tube.
Low T1610 bias or cannot adjust bias	-Open BNC Cable  -Poor connection	-Replace or repair cable  -Reconnect

No Power to Level 2

-Open Power Con Cable

-Replace or repair cable

-Poor connection

-Reconnect

### UNITED STATES LIMITED WARRANTY

Cary Audio Design, Inc. warrants to the original United States purchaser for use in the United States, that this product shall be free from defects in material (except tubes and AF output transistors) or workmanship for:

Amplifiers and Preamplifiers, Three (3) years from the date of the original purchase.

Digital Products, One (1) year from the date of original purchase

During the warranty period, Cary Audio Design, Inc. or an authorized Cary Audio Design, Inc. service facility will provide free of charge both parts (except tubes and AF output transistors) and labor necessary to correct defects in material or workmanship.

To obtain such warranty service, the original purchaser must:

- (1) Complete and send in the warranty Registration Card.
- (2) Notify Cary Audio Design, Inc. as soon as possible after the discovery of a possible defect:
  - (a) The model number and serial number;
  - (b) The identity of the seller and the approximate date of purchase;
  - (c) A detailed description of the problem, including details on the electrical connection in the associated equipment and the list of such equipment.
- (3) Deliver the product to Cary Audio Design, Inc. or the nearest authorized service facility, or ship the same in its original container or equivalent, fully insured and the shipping charges prepaid.

Correct maintenance, repair and use are important to obtain optimum performance from this product. Therefore, carefully read the Operating Manual. This warranty does not apply to any defect that Cary Audio Design, Inc. in its sole discretion determines is due to:

- (1) Improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and the specifications of the original parts.
- (2) Misuse, abuse, neglect or improper installation.
- (3) Accidental or incidental damage.

### WARRANTY DISCLAIMER

Except for the express warranties stated herein, Cary Audio Design, Inc. disclaims all other warranties including, without limitation, all implied warranties of merchantability and fitness for a particular purpose.

### EXCLUSIVE REMEDY

Notwithstanding the foregoing, the purchaser's exclusive remedy for any breach of warranty, express or implied, is limited to the repair or replacement of the defective unit or the refund of the purchase price, at the option of Cary Audio Design, Inc. Under no circumstances is Cary Audio Design, Inc. liable for incidental or consequential damages. Any implied warranties imposed by law terminate one (1) year from the date of purchase.

### FOREIGN PURCHASERS

Cary Audio Design, Inc. warrants its merchandise to purchasers in the United States for use in the United States. It provides no other warranties. If you are a foreign purchaser, consult with your dealer to determine whether your dealer provides any warranty.

The foregoing constitutes Cary Audio Design Inc.'s entire obligation with respect to this product, and the original purchaser and any user or owner shall have no other claim for incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation and exclusion may not apply to you.

This warranty gives legal rights and you may have other rights which vary from state to state.