

# **CAD-2A3 SE**

**OPERATING MANUAL**



## POWER CORRUPTS!

I believe there is a well kept secret in the circles of audio designers. Most designers will not admit to the fact that "the best sounding audio amplifiers are low-powered." Some in the industry believe that even 9 or 10 watts is too much. I have heard it said in many audio forums that, "if the first watt sounds bad, why do I want 200 watts more of the same!"

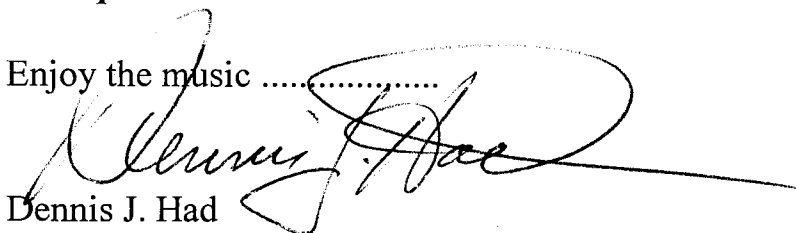
During the design effort on the new Cary Audio CAD-2A3-SE amplifier, I placed a great deal of attention on the "overload recovery" ability of the amplifier. The ability of an amplifier to instantly recover from clipping is much more important than is commonly believed. In the power war of amplifier manufactures 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 of a recovery an amplifier can achieve after overload. With the incredible dynamics range of live and in turn recorded music, even 2,000 watts of power is not enough. Most of the music being listen 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 single-ended triode class A, CAD-2A3-SE mono-bloc amplifier extols its merits in the ability to handle transients and instantaneously recover from brief or even extended overloads. The CAD-2A3-SE mono-blocs will overload symmetrically at any frequency in the audio bandpass. The CAD-2A3-SE's 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 2A3's to recover quickly when over loaded. If one were to monitor the high voltage rail of the CAD-2A3-SE amplifier 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 low powered CAD-2A3-SE single-ended class A triode amplifier is stability. A properly designed class A triode single-ended amplifier maybe operated with no load (without speaker) without damage to the amplifier, output transformer or tubes.

You will note that most of my discussion on the CAD-2A3-SE's has been in the realm of low powered, vacuum tube single-ended triode class A audio amplifiers. The single-ended triode audio amplifier is by nature a low wattage device. In staying within that realm, I conclude that "***High Power Corrupts!***"

Enjoy the music .....

Dennis J. Had  
President

A handwritten signature in black ink, appearing to read "Dennis J. Had", written over a dotted line. The signature is fluid and cursive, with a long horizontal stroke extending to the right.

## ***CAD-2A3-SE***

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

The new CAD-2A3-SE single-ended triode mono-blocs are equipped with the one of the worlds best sounding output tubes of all time. The 2A3, directly heated triode, vacuum tube, is considered by many seasoned audiophiles, to offer the best venue to experience the emotional impact of recorded music. The basic design of the new CAD-2A3-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. We believe the CAD-2A3-SE's will change the way you listen to music. Forever.

### ***CAD-2A3-SE***

For the technically minded, a review of the circuit is in order. The new CAD-2A3-SE Signature mono-blocs operate in pure class A single-ended. The output stage features the 2A3 triode low-mu audio power triode. The output power is 5 watts class A single-ended triode. The output transformer in the new 2A3 Signature is an air gap design with full bias running on a continual basis. The output transformer in the CAD-2A3-SE Signature is the most important component in the amplifier and has been specifically designed by Cary Audio Design for use in the 2A3 Signatures. We have taken the approach in the output transformer design to 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 sixteen 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-2A3-SE Signature'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. A drive signal is applied to the control grid of the 2A3 output tube from the 6SN7 cathode. The 6SN7 is operating as a anode current source to the 6SL7 input gain tube. The input, 6SL7 tube, is operating in a

class A gain stage. The 6SL7 dual triode driver tube is connected in parallel with both triode sections of the tube. The cathode of the 6SL7 is AC bypassed to ground for zero feedback operation.

The power supply in the CAD-2A3-SE Signature actually consists of four different supplies. The power transformer is designed to operate at a 200% continuous commercial service at the full rated 5 watt output level. The high voltage power supply section is a full wave center tap configuration (not some cheap voltage doubler as used in many competitors amps) to a PI network. This high voltage section feeds the final output 2A3 tube through the air gapped output transformer. Another supply feeds a PI network medium voltage supply for the input and driver tubes. There is an additional DC supply to supply DC to all the filaments of all the tubes in the amplifier. The DC filament supply 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-2A3-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 manufactures 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 of 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-2A3 extols its merits in the ability to handle transients and instantaneously recover from brief or even extended overloads. The CAD-2A3-SE's will overload symmetrically at any frequency in the audio bandpass. The 2A3-SE's 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-2A3-SE to recover quickly when over loaded. If one were to monitor

the high voltage rail voltage (310 VDC) at the anode of the 2A3 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-2A3-SE amplifier is stability. The 2A3-SE's may be operated with no load (without speaker) without damage to the amplifier, output transformer or tubes.

### **SPECIFICATIONS**

Operating the CAD-2A3-SE mono-bloc 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 this owner's manual, damage may result. Please read this manual carefully before putting your new CAD-2A3-SE Cary Audio Design amplifiers in operation.

The following definitions are applicable to this manual. These definitions must be followed explicitly.

<p style="text-align: center;"><b>WARNING</b> <b>HAZARD PRESENTS PERSONAL INJURY OR DEATH</b></p> <p style="text-align: center;"><b>Caution</b> EQUIPMENT DAMAGE MAY OCCUR BUT NOT PERSONAL INJURY</p> <p style="text-align: center;"><b>Note</b> Proper performance of the amplifier cannot be ensured if disregarded</p>
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### **1.2 Specifications**

The following section describes the CAD-2A3-SE basic specs. Specifications are subject to change without notice or obligation.

**DIMENSIONS:** 7"H x 5.5"W x 19"D

**WEIGHT:** 28 Lb..

**CIRCUIT TYPE:** Single-End Triode Amplification in Class A

**POWER OUTPUT:** 5 Watts Class A  
2 Watts under 1% distortion

INPUT SENSITIVITY: .950 volt for full output

INPUT IMPEDANCE: 150,000 ohms

NOISE AND HUM: 70dB below rated output

FREQUENCY RESPONSE (at one watt output): 15Hz to 23,000Hz + 0 - 0.75dB

TUBES: 1-6SL7 input tube, 1- 6SN7 anode current source driver tube, 1- 2A3 output tube, 1 - 5U4 rectifier

TRANSFORMERS: 1-EI laminated core power transformer  
1-Special air gap output transformer  
2-Air gap filter chokes  
200% duty cycle on all transformers

RESISTORS: 1% metal film

CAPACITORS: Polystyrene, polypropylene and oil filled coupling cap

POWER SUPPLY CAPACITORS: 2-1200 MFD @ 450VDC  
2- 47 MFD @ 350 VDC  
1- 2 MFD @ 400 VDC film and foil

AC CORD: 3 conductor 14 gauge

AC POWER REQUIREMENTS: 117 volts AC 50/60 Hz  
76 watts operate  
220 volts AC 50/60 Hz  
76 watts operate

WARM-UP TIME: 3 minutes

BREAK-IN PERIOD: 100 hours of music playing time

FINISH: Black epoxy coated steel, Aluminum Face Plate

### **1.3 Front Panel Features**

AC-ON ROCKER SWITCH: Turns AC power on in the "up" position.

STAND-BY/OPERATE: Turns on B+ plate voltage in the "up" position

## 1.4 Rear Apron Features

INPUT: Signal input connection via shielded interconnect cable

OUTPUT: The 5-way binding posts provide the output to the speaker system.  
Red=+, Black=-

AC: 3 conductor power cord

AC power fuse: Use only 2 Amp slo/blo

Bias Jack: 1/4" two conductor to measure DC plate current (60 ma. nominal)

**CAUTION**  
USE OF ANY OTHER PROTECTION FUSE CAN DAMAGE UNIT

AC FUSE: AC power fuse. Never replace with any other fuse than 2 AMP SLOW BLOW! 250 VOLT!

**CAUTION**  
NEVER REMOVE/INSERT AC LINE CORD WHEN THE UNIT IS ON

## INSTALLATION

This section describes the unpacking and installation procedures for the CAD-2A3-SE amplifier.

**WARNING**  
**MAKE NO ATTEMPT TO PUT THE CAD-2A3-SE AMPLIFIER IN SERVICE WITHOUT THE BOTTOM PLATE ATTACHED - CONTACT WITH VOLTAGE IN THE CAD-2A3-SE CAN BE FATAL!!!**

## 2.2 Unpacking

All shipping containers have been specifically designed to protect their contents and special care has been taken to prevent damage under normal shipping conditions. Mishandling should be evident upon inspection of the shipping container. If damage is found after visual inspection, take care not to destroy the evidence. If necessary,



document the damage with photographs and contact the transport carrier immediately.

Carefully remove your new CAD-2A3-SE amplifier from its packing carton, and examine it closely for signs of shipping damage. It is recommended to save all original packing cartons to protect your amplifier from damage should you wish to store it or ship it for after sales service.

### **2.3 Warranty Card**

Fill out the enclosed warranty registration card and return to Cary Audio Design within 10 days of original purchase. Keep your original sales slip with the packing cartons should you ever need it for reference. **Failure to register warranty will limit the warranty to one year.**

### **2.4 Amplifier Placement**

In general, the location of your new CAD-2A3-SE amplifier is not critical. The best placement in your system is near the speaker system with short lengths of speaker cables. Certain precautions must be taken to ensure optimum performance. Avoid extremely hot locations such as near radiators or other heating units. Keep the top of the 2A3-SE's clear of books, paper or other equipment to protect against overheating.

### **2.5 Power Requirements**

The CAD-2A3-SE is designed to operate from house current mains. The design voltage is 117VAC at 50/60 Hz. The duty cycle of your new CAD-2A3-SE is 200%. You may wish to leave the unit on in the operate position 24 hours a day. (Foreign units 100 - 234 VAC at 50.60Hz)

### **2.6 Cables**

The speaker cables from the output posts of the CAD-2A3-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-2A3-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.

## **OPERATION**

Signal input connection is made via the input jack on the rear of the amplifier located

next to the output binding posts. 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.

### **3.1 Operation**

Your new CAD-2A3-SE's are ready for operation after the speaker, interconnect cables and the three tubes have been installed. Tube positions are listed on the sheet in the front of this manual.

### **3.2 AC On Power Switch**

Simply flip the AC rocker switch up to the ON position (the blue LED will light). Observe that all tubes are lit (filaments).

### **3.3 Stand-By Operate Switch**

In the down position the plate voltage will be in stand/by. Turning the switch to the "up" position will bring up the operating B+ voltage on the plates of the vacuum tubes. The plate voltage BLUE LED will light when the unit is in full operate. The main purpose of the stand-by switch is to let the amplifier warm up for a minute or so before switching on the plate voltage B+ voltage.

### **3.4 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-2A3-SE's may seem sterile or thin sounding right 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**

<p style="text-align: center;"><b>WARNING</b> <b>MAKE SURE AMPLIFIER IS UNPLUGGED FROM AC MAINS</b></p>
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### **4.1 CAD-2A3-SE Care and Cleaning**

The chassis of the CAD-2A3-SE may be cleaned with a soft rag and Windex (or a similar window cleaner). The frequency of cleaning will be governed by how many hours the CAD-2A3-SE is operated and by operating environmental cleanliness.

### **4.2 Tube Replacement**

If it becomes necessary to replace the tubes in the CAD-2A3-SE amplifier, a matched set of tubes of the same brand should be used. A new tube kit is available from your Cary Audio dealer. You should get year's from the output tube with everyday usage and many, many years of use from the 6SL7 and 6SN7 input tube as well as the 5U4 rectifier.

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### **4.3 Factory Service**

Careful consideration has been given to the design of your CAD-2A3-SE amplifier to keep maintenance problems to a minimum. However, it is possible that some problems may arise which cannot be cured by tube substitution. At this point we suggest that you contact our Customer Service Department, phone number 1-919-481-4494, to describe your problem in detail. Do not return the amplifier 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 a damage claim due to improper packing or lack of insurance should the unit be lost in shipment.

### **WARNINGS**

**MAKE NO ATTEMPT TO PUT THE CAD-2A3-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**

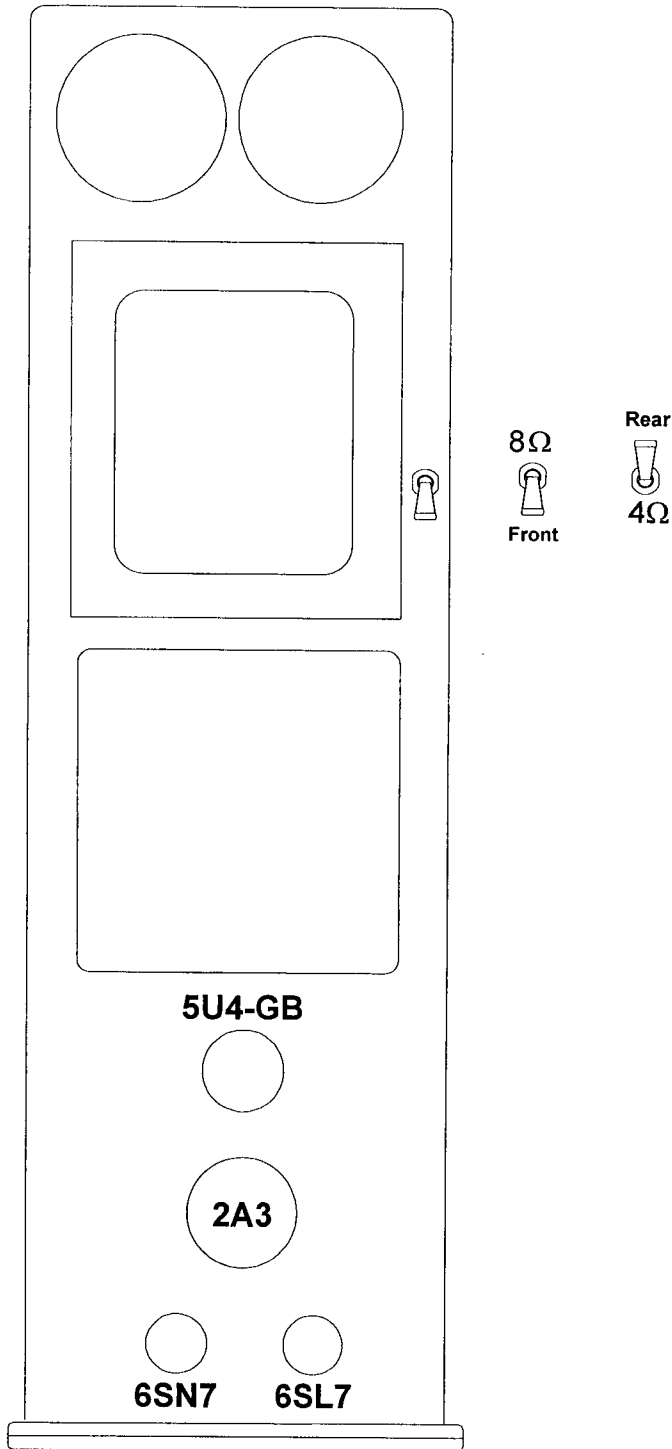
**NEVER REMOVE/INSERT AC PLUG WHEN THE UNIT IS ON OR THE AC POWER SWITCH IS IN THE "ON" POSITION.**

**OBSTRUCTION OF THE TOP PORTION OF THE CAD-2A3-SE WILL RESULT IN TUBES OVERHEATING.**

**\*\*\*OBSERVE DIRECTIONS IN THIS MANUAL\*\*\***

### **NOTES:**

## 2A3-SE Tube Placement



**\*\*\* WARNING: When installing 2A3 tubes; Large pins orient towards the front of the chassis. Failure to follow these guidelines will result in severe damage to your equipment.**

## UNITED STATES LIMITED WARRANTY

Cary Audio Design 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 three (3) years from the date of the original purchase.

During the warranty period, Cary Audio Design or an authorized Cary Audio Design 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 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 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 performance from this product. Therefore, carefully read the Instruction Manual. This warranty does not apply to any defect that Cary Audio Design in its sole discretion determines is due:

- (1) Improper maintenance or repair, including the installation of parts or accessories that does 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 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. Under no circumstances is Cary Audio Design 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 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 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, so the above limitation and exclusion may not apply to you.

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