



CAD-280SA

V12

OPERATING MANUAL

NOTE: Before installing your new CAD-280 SA, please read this manual carefully as it will inform you of the CAD-280 SA's specifications, proper installation procedures and operation procedures. Also included in this manual are guidelines on how to properly service and care for your new CAD-280 SA.



Dear Audiophile Friend:

I would like to take this opportunity to personally thank you for purchasing your new Cary Audio V12 amplifier. I have spent countless hours designing and voicing the V12 stereo amplifier. My associates at Cary Audio have on numerous occasions asked why I was spending so much time with this product. If I may, I would like to give you some insights on the design and performance of the CAD-280-SA, V12 amplifier.

The V12 is a different breed of Cary that delivers high performance in a combination of class A single-ended triode and true balanced push-pull technology. The new V12 is created by a stunning combination – the world famous CAD-805 sound stage, the glorious midrange of the CAD-300-SE, and the super charged power of the CAD-211-M's. The V12 is designed with a fresh and uncompromising push-pull circuit in every criterion. In reality, think of the V12 as four, single-ended class A amplifiers, operating in a combined balanced configuration.

Another design criteria with the V12, was to utilize only modestly priced vacuum tubes available from multiple tube manufacturing sources. For those of you not aware, I am a triode-crazed audiophile. Do EL-34's or KT-88's tubes have any merit? They sure do! Simply take a look at the curves when connected in the triode mode. Looks similar to the good ole 300B or 2A3 for that fact. Even the 6L6 looks like a great tube when run in the triode configuration. With this in mind, off I went, spending enormous amounts of time to create some realistic musical excitement. As I developed the V12, I soon discovered that I was enjoying it much too much. I mean, it was push pull in design. I was able to develop some nice triode parameters utilizing an extremely sophisticated output transformer design. I was on my way with the "fun factor". As I continued to design and listen, my wife, Donna, proclaimed, "you are producing some exciting and powerful sound tonight honey". I believe Donna's comments were déjà vu. She had the same impressions years ago when I was designing the CAD-805's.

C A R Y . A U D I O . D E S I G N

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For the technically minded, a review of the circuit is in order. Your new Cary Audio V12, performs in two distinct class of operation. The absolute best sounding mode is class A triode. For the occasions you may wish to simply play loud, you may chose the class AB, ultra linear mode. In order to change modes of operation, all you need do is flip the six toggle switches to either the triode or the UL position mode. The switching process may be done on the “fly”. In other words with the amplifier playing in the full operating position. I can tell you that the sound of class A operation is truly the best mode for serious music listening.

OUTPUT TUBES

The output stage, 12 EL-34 tubes are fixed biased, with an equal negative bias voltage to ensure maximum linearity. Utilizing this bias network will permit the user to try many different types of output tubes if desired. Some of the choices may range from KT-88's, 6550's, KT-90's, KT-66's to 6L6's. One might even wish to listen with 6V6's. All these output tubes will present their own sonic signature. There is a bias adjustment required for each channel when listening with these different types of audio tubes in your new V12 amplifier. The output power is 50 watts each channel in the triode mode, utilizing EL-34's, KT-88's, 6550's or KT-90's. You may wish to operate with KT-66's, 6L6's or even 6V6's. The output power with these lower dissipation tubes will yield from 30 to 35 watts output power triode. Speaking of output power. Your new V12 has a peak envelope power of 72 watts into an average loudspeaker load in the triode mode.

IMPORTANT BIAS NETWORK

I would like to speak about the bias system in the V12. You will notice on the rear panel there are two (2) individual bias potentiometers along with two (2) separate bias jacks. In addition, please look at the top chassis red LED's. These are conveniently located behind each EL-34 output tube. These LED's can be referred to as the “good health” tube indicators. With just a simple glance, you will be able to see that each tube is functioning properly by the red glow of the LED behind each tube. You may also bias the V12 utilizing these 12 LED's. The procedure is actually quite simple. Please follow these steps for LED indication bias setting:

- #1 - All tubes must be installed in the V12
- #2 - Turn each of the two (2) bias pots on the rear of the V12 to the full counter clockwise position. In other words turn fully to the left.
- #3 - With the V12 plugged into the house AC mains, turn on the power switch. The three blue LED's on the front panel should light and indicate left and right channel bias voltage and high voltage.
- #4 - Turn the operate/standby to the up operate position.
- #5 - Check that all tube filaments have lit.
- #6 - Look at each of the 12 red LED's. They should **NOT** be lit at this time.
- #7 - Wait about five (5) minutes for the tubes to completely warm up.
- #8 - Insert a bladed screwdriver into the right bias potentiometer. **SLOWLY** advance in a clockwise motion this bias control until you notice one or more red LED's lighting behind each of the right channel six EL-34 output tubes. When you have reached equal brilliance on each tube **STOP** any further adjustment. You may wish to rotate in the opposite counter clockwise direction to observe each LED stop lighting. Then once again rotate the bias pot in the clockwise direction until all LED's are lit. **DO NOT ADVANCE BEYOND THIS POINT!!!!!!!!!!!!**
- #9 - Perform the same procedure as in number 8 (#8) above for the left channel.

This instructions above will bring the amplifier into operating bias. The more exacting method is to insert a DC bias meter into each bias jack and adjust each channel to between 275 to 300 ma. DC current. Please, please, remember this is a **DC current reading**. NOT DC VOLTAGE!

The red LED's can also be used to trouble shoot the amplifier if you start to lose ½ amp tube fuses. The loss of a tube fuse is an indication of either excess current drawn in the AB ultra linear mode of operation or a defective output tube. To check for a faulty output tube simply look at the red LED's. If one is not lit, this an indication that the tube is defective. If you turn down the bias pot on a given channel and one LED continues to stay lit much after the others have gone off, this is another indication of a defective tube. With the modest voltage of 365 VDC on the output tubes, a defective tube will be a rare occurrence. Tubes should last upwards to five or more years in the new V12 amplifier.

ADDITIONAL TECH TALK

There are a number of significant differences that separate the Cary Audio V12 stereo amplifier from competitive products. I would like to address some of the more significant technical features of your new V12.

First, as mentioned above, a separate adjustable bias voltage supply is incorporated for each channel. These two individual bias supplies each have a pi network filter system incorporating an individual filter choke for each channel supply. In simplistic terms, one does not interfere with the other. Next is an additional dual channel bias supply for the EL-84 current source tubes. This is factory preset and will not need any adjustment. Second, and so important ... the main power transformer contains two separate high voltage secondary windings. Each winding serves the high voltage supply for each right and left channel. The rectification is accomplished utilizing multiple solid state 3 amp diodes in a center tap full wave rectification system. Keep in mind, there are two individual high voltage supplies, one for each channel bank of output tubes. Once again the high voltage supply is a pi network filter choke system. Two filter chokes, one for each channel. The 6922 input driver tubes are each powered by individual regulated power supplies. One for each channel. These regulated front-end supplies offer explosive dynamics no matter how loud one is playing their V12 amplifier.

The output transformers in the V12 are actually one of the most important components in the amplifier. These transformers are rated at 125 watts continuous power output. The primary to secondary ratio is quite low, thus allowing the V12 to control the loudspeaker drivers with great ease.

OVERVIEW AND CLOSING THOUGHTS

The V12 is in reality four single-ended amplifiers operating without any form of feedback. The sound stage is huge and the loudspeakers will disappear. The mid range takes on the character of a 9 watt single-ended triode amplifier with the advantage of push-pull horsepower.

Thank you once again for your support in Cary Audio Design.

Dennis J. Had

SPECIFICATIONS

Operating the CAD-280 SA stereo 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 Cary Audio Design CAD-280 SA in operation. The following definitions are applicable to this manual. These definitions must be followed explicitly.

WARNING
HAZARD PRESENTS PERSONAL INJURY OR DEATH

Caution
EQUIPMENT DAMAGE MAY OCCUR BUT NOT PERSONAL INJURY

Note
Proper performance of the amplifier cannot be ensured
if disregarded

1.2 Specifications

The following section describes the CAD-280 SA basic specifications. Specs are subject to change without notice or obligation.

DIMENSIONS: 9''H x 12 ½''W x 20''D

WEIGHT: 85 lb..

CIRCUIT TYPE: Push-Pull Ultralinear Amplification in Pure Class A

FEED BACK: Zero

POWER OUTPUT: 50 watts - Triode
100 watts - Ultralinear

INPUT SENSITIVITY: 2 volts for full output

INPUT IMPEDANCE: 150,000 ohms

NOISE AND HUM: 84db below rated output

FREQUENCY RESPONSE (at full power output): 20Hz to 23Khz +/- 1db

TUBES: 2- 6922 Input + Driver
2- SV83/ EL84 Current Source
12- EL34 Output tubes

POWER TRANSFORMER: 1- EI laminated, 200% duty cycle

OUTPUT TRANSFORMERS: 2-EI laminated, Silicon Impregnated

RESISTORS: 1% metal film

CAPACITORS: Oil Filled

POWER SUPPLY CAPACITORS: 4 - 560 MFD @ 400 volts

AC CORD: 3 conductor shielded detachable

AC POWER REQUIREMENTS: 117/234 volts AC 50/60Hz

POWER CONSUMPTION: 420 watts operate
10 watts in stand-by

WARM-UP TIME: 3 minutes

BREAK-IN PERIOD: 100 hours of music playing time

FINISH: Jaguar Red

FRONT PANEL: Machined, Black Anodized aluminum

1.3 Front Panel Features

POWER OFF SWITCH: Toggle switch turns on AC mains and high voltage in "on" position

HV LED: Indicates high voltage on

BIAS L led: Indicates Bias voltage for Left channel

BIAS R led: Indicates Bias voltage for Right channel

OPERATE/ STANDBY SWITCH: Turns filaments on in the "operate" position.

1.4 Rear Apron Features

INPUTS RCA or XLR: Signal input connection via shielded interconnect cable

RCA/ XLR SWITCH: Switches between RCA and XLR inputs.

SPEAKER OUTPUT: Three- 5-way binding posts provide the output to the speaker system. Red = 4,8 ohms, Black = ground

AC: 3- conductor shielded power detachable cord to AC power mains.

<p style="text-align: center;">CAUTION EQUIPMENT DAMAGE MAY OCCUR WITH IMPROPER FUSES</p>
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POWER AC FUSE: This is an over current protection fuse for the power transformer.
Never replace with any other fuse than 3 AMP SLOW BLOW!
250 VOLT! (2 AMP SLOW BLOW ON 220 VAC OPERATION)

FILAMENT FUSE: This is an over current protection fuse for the filament transformer.
Never replace with any other fuse than a 2 AMP SLOW BLOW!
(1 AMP SLOW BLOW on 220v operation)

LEFT AND RIGHT TUBE FUSE: This is a protection fuse for the output tubes. Never replace with any other fuse than a .5 amp fast blow! 250 volt.

<p style="text-align: center;">CAUTION NEVER REMOVE / INSERT AC LINE CORD WHEN THE UNIT IS ON</p>
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1.5 TOP PANEL FEATURES

TRIODE/ ULTRA-LINEAR SWITCHES: Three switches per channel to choose from 50 watts of power in the Triode mode or 100 watts of power in the Ultra-Linear mode. All of the switches should be in the same direction.

RED LED'S: Indicator for each tube. When lit it shows the tube is working.

INSTALLATION

This section describes the unpacking and installation procedures for the CAD-280 SA amplifier.

WARNING
MAKE NO ATTEMPT TO PUT THE CAD-280 SA AMPLIFIER IN SERVICE WITHOUT THE BOTTOM PLATE ATTACHED - CONTACT WITH VOLTAGE IN THE CAD-280 SA CAN BE FATAL!!!!

2.1 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-280 SA stereo 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.

2.2 Warranty Card

Fill out the enclosed warranty registration card and return it to Cary Audio Design, Inc. 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.**

2.3 Amplifier Placement

In general, the location of your new CAD-280 SA is not critical. 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 CAD-280 SA clear of books, paper or other equipment to protect against overheating!! **DO NOT** place your CAD-280 SA in a closed book case - overheating will damage the amplifier! Allow 8 to 10 inches above the unit for proper ventilation.

2.4 Power Requirements

The CAD-280 SA is designed to operate from house current mains. The design voltage is 117 VAC at 50/60Hz. (Foreign units 234 VAC at 50/60Hz.)

2.5 Cables

The speaker cables from the output posts of the CAD-280 SA 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-280 SA. 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 jacks on the rear of the CAD-280 SA located on the rear panel. The interconnect cables from the output of the CD player, tuner, etc. 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-280 SA is ready for operation after the speaker and interconnect cables have been installed. Refer to the tube placement sheet at the end of this manual for proper installation. On rear panel select either RCA or XLR.

3.2 4/8 OHM Binding Post

Select the proper binding post (4 or 8 ohm) for the speakers in your system. The selection should be based on your speakers specifications:

3.3 Triode/ Ultra-Linear Switches

Select either "Triode" 50 watts or "Ultra-Linear" 100 watts. Make sure all six switches are set to the same position. You can select while playing music. Flipping one switch at a time is ok.

3.4 Power/ On and Standby/ Operate Switches

Simply flip the power switch to the "On" position then flip the standby switch to "operate". Observe that all 16 tubes are lit. When the power tubes start to conduct the red led's on the top panel will light.

3.5 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-280 SA will 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.

3.6 Bias Measurement

The bias is factory preset. It is a good idea to measure it during the initial setup to make sure it is set to the specifications provided at the end of this manual. The AC voltage may be different from one area to the next. Follow the instructions provided. You will need a meter that allows you to read up to 300mA.

WARNING
MAKE SURE AMPLIFIER IS UNPLUGGED FROM AC MAINS BEFORE
SERVICING

SERVICE AND CARE

4.1 CAD-280 SA Care and Cleaning

The case and front of the CAD-280 SA may be cleaned with a soft cloth and Windex or a window cleaner. The frequency of cleaning will be governed by how many hours the CAD-280 SA is operated and by operating environment cleanliness. The chassis is best cleaned with car wax.

4.2 Tube Replacement

If it becomes necessary to replace the tubes in the CAD-280 SA amplifier, a matched quartet set of output tubes of the same brand should be used. A new tube kit is available from Cary Audio Design, Inc. You should get a few years or more from the output tubes with everyday usage and many, many years of use from the 6922 & SV83 input tubes.

4.3 FACTORY SERVICE

Careful consideration has been given to the design of your CAD-280 SA 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 you contact our Customer Service Department phone number (919)481-4494 to describe your problem in detail. DO NOT return the CAD-280 SA to the factory without a return authorization number from the Customer Service Department.

Cary Audio Design, Inc. will assume no responsibility if the transportation company refuses to pay a damage claim due to your improper packing or lack of insurance should the unit be lost or damaged in shipment.

WARNINGS

MAKE NO ATTEMPT TO PUT THE CAD-280 SA IN SERVICE WITH THE BOTTOM PLATE REMOVED. 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-280 SA WILL RESULT IN TUBES OVERHEATING AND DAMAGE TO THE AMPLIFIER.

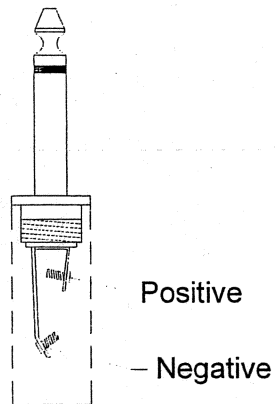
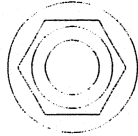
!!OBSERVE DIRECTIONS IN THIS MANUAL!!

CAD-280 SA TROUBLESHOOTING GUIDE

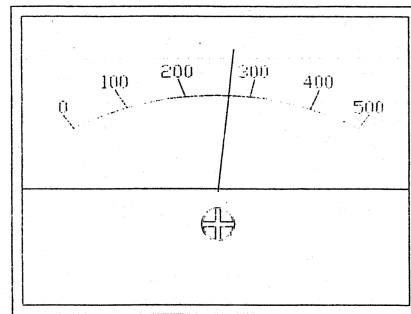
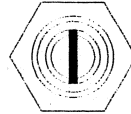
SYMPTOM	CAUSE	REMEDY
Hum or "Buzzing" through speakers	-Ground Loop	-Install 2-pin adapter on A.C. cord to float the ground.
	-Intermittent or poor connection of interconnect ground	-Replace interconnect.
"Popping or Spitting" noise through the speaker	-Noisy tube.	-If noise is in one channel, swap one section of tubes at a time until the noise swaps channels. Replace noisy tube.
		-Check bias of output tubes. If high or fluctuating rapidly, replace output tube. (See bias instruction sheet)
AC fuse blows	-Line voltage surge	-Replace fuse.
Tube fuse blows	-Shorted output tube	-Replace tube. -To find the bad tube turn the bias adjustment counter-clockwise all the way. Turn the amp on and to operate. Slowly turn the bias and observe which led lights up first. This would most likely be the shorted tube.
No Bias Current	- Blown tube fuse	- Replace fuse
	- Defective meter or blown fuse inside meter.	- Replace meter or fuse in meter

CAD-280-SA Bias Adjustment

Bias Meter Jack



Bias Adjust

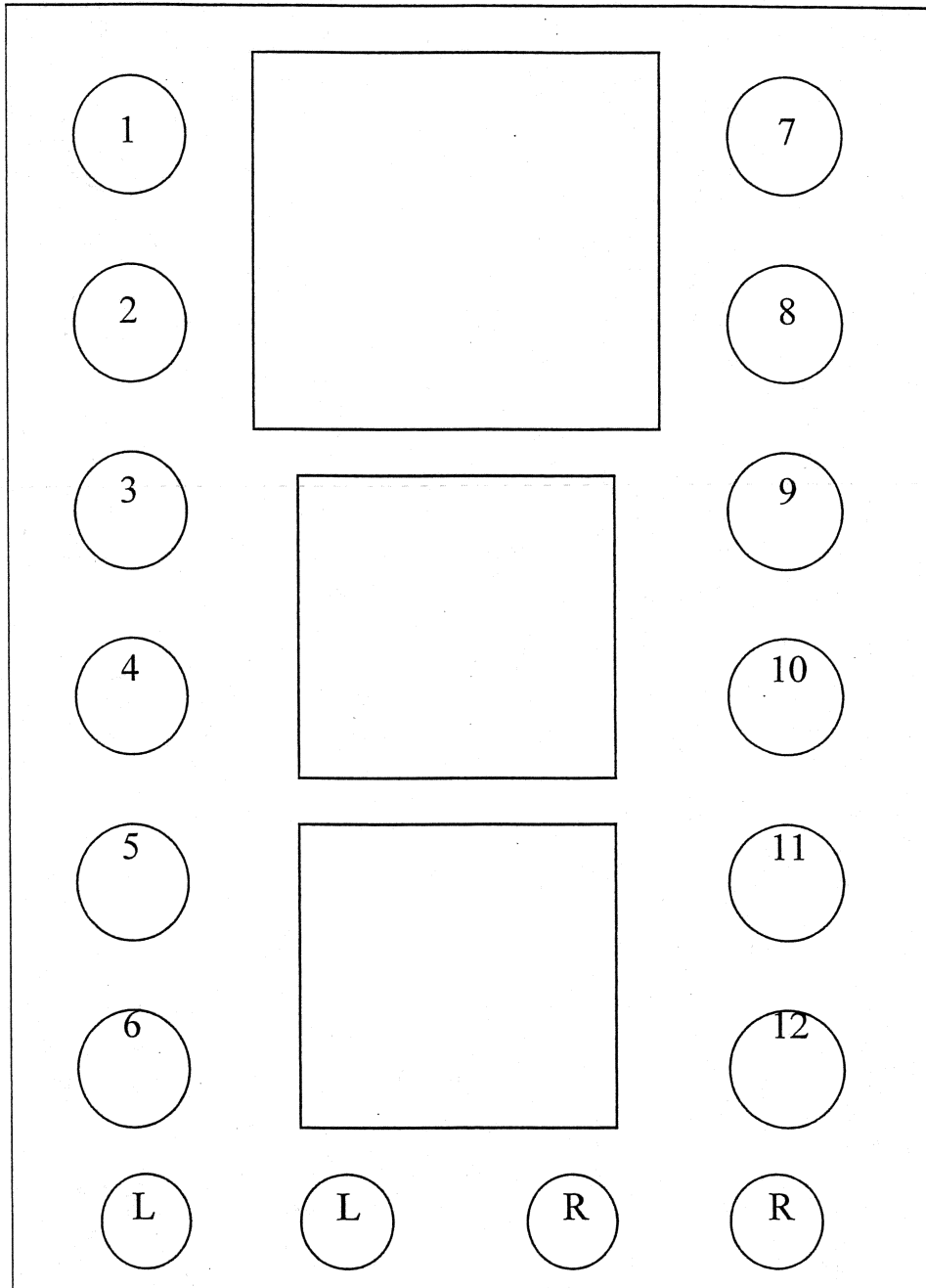


Set bias for each side of the amplifier to 275mA

Insert meter plug into bias jack.
Adjust for 275mA reading on VOM or DC current meter.
Readjust to 275mA after after V12 is warmed up for
10 minutes. Remove plug and enjoy the music!

Note: Bias is factory preset; Bias should be reset when installing replacement EL34BSTR tubes.

CAD-280-SA Tube Placement



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.

CARY

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