

SAE

SAE 2HP-D

SAE

Components For The Connoisseur



2HP-D Main Amplifier Operator's Manual

Special order stainless steel front panel shown. 

PREFACE

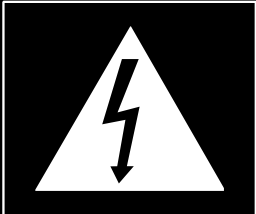
CONGRATULATIONS. You have just acquired one of the most advanced audio components ever developed.

Your SAE 2HP-D was designed to set new standards in virtually every performance category. Not only does the 2HP-D utilize a dual-differential balanced design, to our knowledge, it is the world's first amplifier to be balanced both electrically and physically. Each circuit board in the active signal path is designed with mirror imaged traces with the ground-point, the fulcrum of the design, positioned at its absolute center.

Other significant advances in the amplifier include:

1. Dual mono design with separate and independent power transformers, power switches and line cords;
2. High temperature (Class F rated) toroidal transformers each with 1930 VA;
3. Separate and independent transformer windings for the input and output stages;
4. Independent transformer windings for each half of the balanced amplifiers;
5. Independent bridge rectifiers for each half of the balanced amplifiers;
6. Four layer circuit boards used throughout; each with separate power and ground planes;
7. Mirror imaged board layout with a perfectly centered ground point. *The circuit is both electrically and physically balanced;*
8. Solid copper bus bar;
9. Current feedback for improved amplifier control and virtually unlimited slew rate;
10. Double transistor input stage;
11. Dual-DC Servos virtually eliminate any DC offset;
12. ThermalTrak output devices optimize bias in real-time;
13. All protection circuitry is optically coupled and outside the circuit path. It is self-resetting;
14. Built-in distortion limiter compares amplifier input *and* output and supply voltage to output voltage before engaging. When engaged, amplifier clipping is eliminated and THD cannot exceed 1%;
15. User selectable forced air (fan) cooling may be engaged or disabled as necessary.
16. Virtual VU and Frequency Spectrum Display Meters. These meters uniquely show the amplifiers instantaneous peak power output and average power output simultaneously without the inertia that causes inaccuracies in mechanical meters.

	CAUTION RISK OF ELECTRICAL SHOCK DO NOT OPEN	
CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK) NO USER-SERVICEABLE PARTS INSIDE REFER SERVICING TO QUALIFIED SERVICE PERSONNEL		



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of significant magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

WARNING

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK,
DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THE AC (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

Extension cords are not recommended for use with this product.

Amplifier Identification Record

This information is for your records and for future identification of the 2HP-D. Please take a moment to fill out all pertinent data now, and as upgrades and/or options are installed. Whenever upgrades, inquiries and/or changes are requested, the serial number will be required.

SERIAL NUMBER

DATE PURCHASED

DEALER'S NAME

DEALER'S ADDRESS/PHONE

IMPORTANT

Save all packaging in a dry place away from fire hazards. Your amplifier is a precision electronic instrument and should be properly packaged any time shipment is made. In the unlikely event that you have to return your 2HP-D to the factory or dealer for service or updating, the original packaging will best protect the unit from shipping damage.

In order to achieve the fullest flexibility and enjoyment from your SAE 2HP-D, we recommend that you read this manual in full before connecting the unit to your audio system.

Warning: Each channel of the 2HP-D is a balanced bridge amplifier, thus the negative speaker terminal is NOT a ground, and cannot be connected to a system ground or a loudspeaker system with a common ground. Consult your speaker manufacturer to ensure that any speaker in your system that will be connected to the SAE 2HP-D does NOT have internal circuitry with a common ground.

Note: It is imperative that your 2HP-D be operated in a well-ventilated environment and that the immediate external temperature be maintained as specified. If you need to stack any equipment directly above or below the amplifier, please engage the cooling fan to protect it from overheating.

SAFETY PRECAUTIONS

Please carefully read each item of the operating instructions and safety precautions before installing and using this product. Use extra care to follow the warnings written on the product itself and/or in the operating instructions. Keep the operating instructions and safety precautions for future reference.

CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE ANY OF THE COVER PANELS.

NO USER-SERVICEABLE PARTS INSIDE. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT ALLOW LIQUIDS TO SPILL OR OBJECTS TO FALL INTO ANY OPENINGS OF THE PRODUCT.

THIS UNIT IS SUPPLIED WITH TWO 3-PIN GROUNDED AC PLUGS. ALWAYS INSERT THE AC PLUG INTO A GROUNDED OUTLET. DO NOT REMOVE THE GROUND PIN OR DISABLE THE GROUND FOR ANY PURPOSE.

BEFORE MAKING ANY CONNECTIONS TO THE 2HP-D, FIRST TURN OFF THE POWER AND THEN DISCONNECT THE AC POWER CORD.

WHEN INSTALLING THE 2HP-D IN YOUR SYSTEM, MAKE CERTAIN TO ALLOW A MINIMUM OF 6 INCHES OF VENTILATION ON TOP AND ON EACH SIDE OF THE UNIT. IMPROPER VENTILATION OF THE UNIT MAY CAUSE OVERHEATING, WHICH MAY DAMAGE THE UNIT AND CAUSE A FIRE. PLACE THE UNIT ON A SOLID SURFACE ONLY. I.E. NOT ON CARPET, ETC.

DO NOT PLACE THE 2HP-D NEAR HEAT SOURCES SUCH AS DIRECT SUNLIGHT, STOVES, HEAT REGISTERS, RADIATORS OR OTHER HEAT PRODUCING EQUIPMENT.

TO PREVENT DAMAGE TO THE ANALOG OUTPUT CIRCUITRY, BE CERTAIN TO NEVER SHORT THE OUTPUT SIGNAL TO GROUND. ENSURE THAT YOUR AUDIO OUTPUT CABLES DO NOT HAVE ANY INTERNAL SHORTS BEFORE CONNECTING THEM TO THE 2HP-D.

IF REPLACEMENT OF THE AC LINE FUSE AND/OR ANY INTERNAL/EXTERNAL FUSE BECOMES NECESSARY, REPLACE ONLY WITH SAME VALUE AND TYPE OF FUSE. NEVER BYPASS THE FUSE.

IF THE AC CORD BECOMES DAMAGED, DO NOT USE IT. IMMEDIATELY REPLACE IT WITH A NEW ONE OF THE SAME OR BETTER RATING.

IT IS IMPERATIVE THAT 2HP-D BE OPERATED IN A WELL VENTILATED ENVIRONMENT AND THE IMMEDIATE EXTERNAL TEMPERATURE BE MAINTAINED AS SPECIFIED. DO NOT STACK ANY EQUIPMENT DIRECTLY ABOVE, BELOW OR TO THE IMMEDIATE SIDES OF THE 2HP-D AS TO PROTECT IT FROM OVERHEATING, AS WELL AS THE CONTINUED FUNCTIONALITY OF ANY EQUIPMENT NEAR AND AROUND IT.

EACH CHANNEL OF THE 2HP-D IS A BALANCED BRIDGE AMPLIFIER, THUS THE NEGATIVE SPEAKER TERMINAL IS NOT A GROUND AND CANNOT BE CONNECTED TO A SYSTEM GROUND OR A LOUDSPEAKER SYSTEM WITH A COMMON GROUND. PLEASE CONSULT YOUR SPEAKER MANUFACTURER TO ENSURE THAT ANY SPEAKER IN YOUR SYSTEM THAT WILL BE CONNECTED TO THE SAE 2HP-D DOES NOT HAVE INTERNAL CIRCUITRY WITH A COMMON GROUND.

AFTER MARKET and THIRD PARTY MODIFICATIONS

PLEASE NOTE THAT ANY AFTER MARKET AND/OR THIRD PARTY MODIFICATION WILL VOID THE WARRANTY.

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INTRODUCTION

Getting to know your SAE 2HP-D

This SAE 2HP-D amplifier has been put through a rigorous and unique testing procedure that ensures that it will last for many years with minimal service requirements. This procedure includes the following:

- All assembled circuit boards are given a thorough visual inspection and are then tested in a bench-reference amplifier.
- The tested, assembled circuit boards are then installed in a new 2HP-D and the whole unit is tested for every function and parameter.
- The unit is put on a burn-in torture rack to test for any possible component failures.
- The amplifier then undergoes a critical listening and functional test.
- The unit has all remaining chassis components installed and then undergoes a complete visual inspection, which assures that all SAE amplifiers meet visual specifications.

Burn-In/Break-In Time

This unit has a break in period of about 1 week during which continuous improvement in sound quality will be observed. It is recommended that music be played continuously through the unit during this time to expedite the break in period.

Reference Manual Conventions

For clarity purposes, references to buttons and LED's will be shown in bold capital letters.

IMPORTANT NOTICE

- I. It is imperative that the SAE 2HP-D be connected to a ground via its three wire AC power cord. It is important that the AC power outlet, which the amplifier is plugged into, is actually grounded. Failure to do so will severely compromise the performance, reliability and safety of use of the SAE 2HP-D.
- II. Ventilation is an important issue when placing the SAE 2HP-D in a system. If the amplifier is intended for passive (convection) cooling, please make certain that it is placed in a well-ventilated area or rack unit. If the amplifier will operated with fan cooling, please allow space at the rear for heat to be discharged and cool air must be allowed to enter the amplifier.
- III. Please take note that powerline conditioners are not generally recommended for use with the SAE 2HP-D. If it is your intention is to plug the 2HP-D into a line conditioner, check with your dealer to make certain that the particular conditioner that is intended for use DOES NOT DEFEAT THE AC GROUND on its AC outlets and that it is capable of 20A operation. Otherwise, the amplifier's power output may be compromised.
- IV. DO NOT remove any cover panels from the amplifier as there are no user serviceable components inside. Refer servicing and updating to qualified service personnel only.

FRONT PANEL LAYOUT

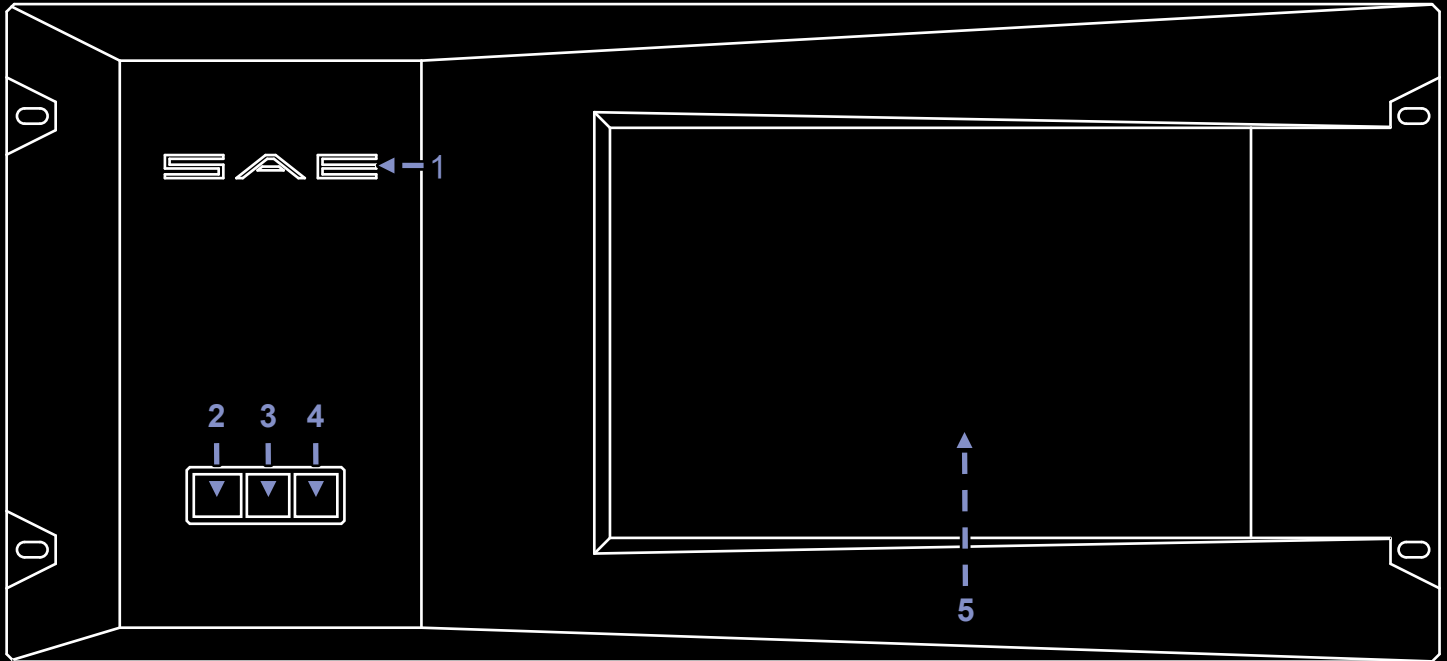
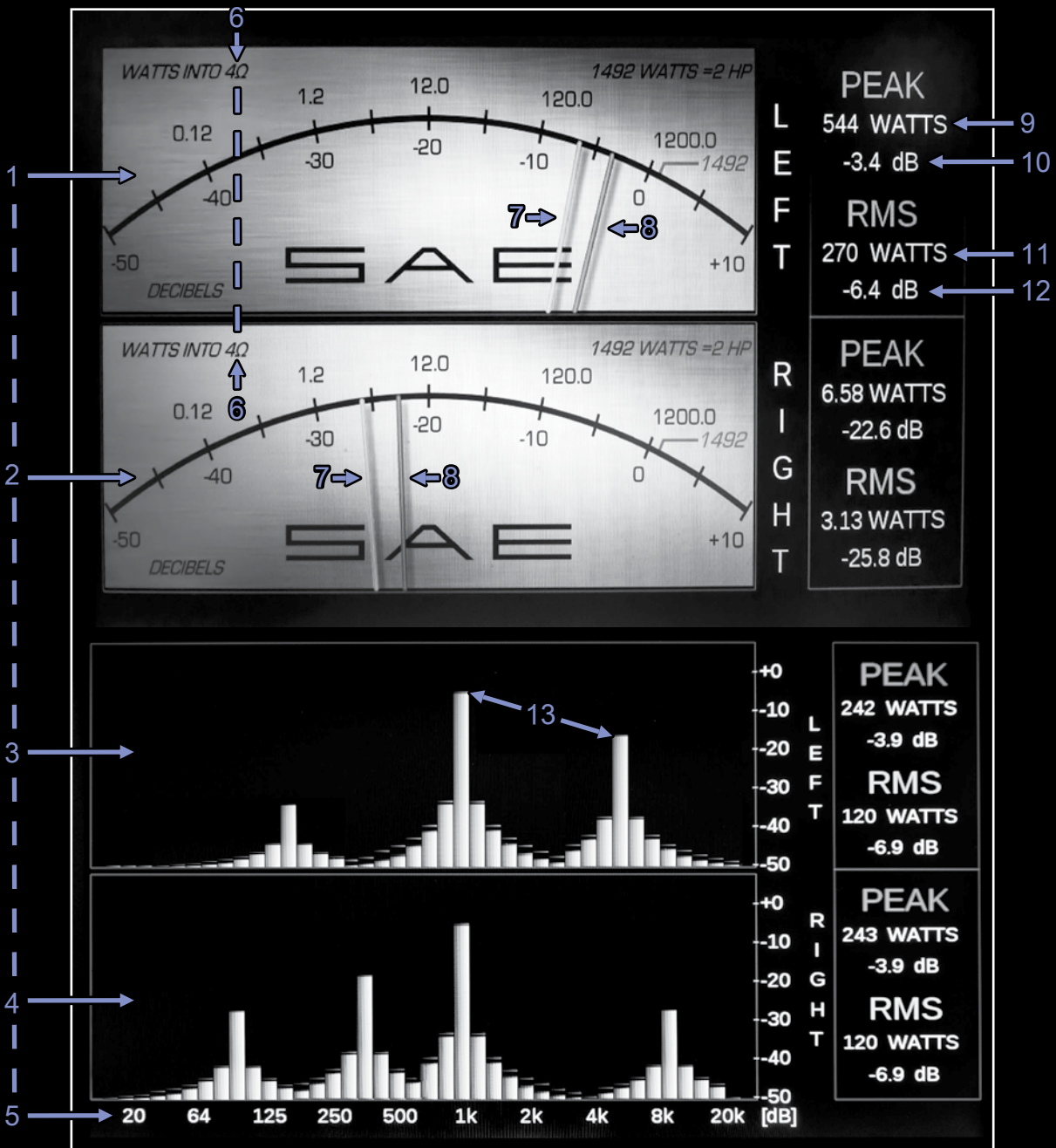


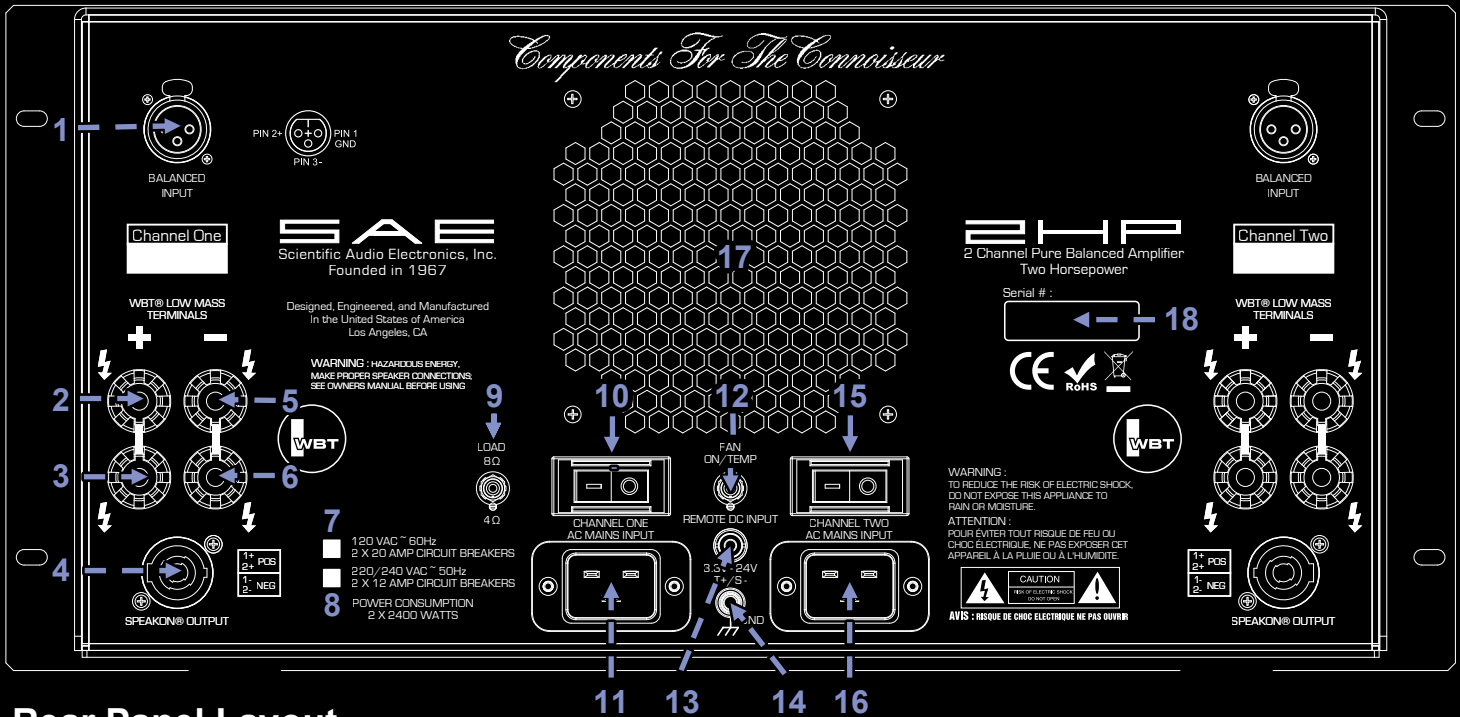
Figure 2 - Front Panel Layout

1. **ILLUMINATED LOGO.** Illuminates when the amplifier exits the STANDBY Mode.
2. **STANDBY SWITCH.** After the rear panel MAIN POWER switch(es) are turned on, touch the front panel button to exit the standby mode and enter the operational mode. Press again to return to STANDBY.
3. **METER ON/OFF SWITCH.** Turns the virtual VU Meter/Spectrum Display on and off
4. **METER DISPLAY SWITCH.** Selects the VU Meter or the Frequency Spectrum Display
5. **VIRTUAL VU METER/FREQUENCY SPECTRUM DISPLAY**



1. LEFT CHANNEL VIRTUAL VU METER
2. RIGHT CHANNEL VIRTUAL VU METER
3. LEFT CHANNEL FREQUENCY SPECTRUM DISPLAY
4. RIGHT CHANNEL FREQUENCY SPECTRUM DISPLAY
5. FREQUENCY INDICATOR Divides the frequency spectrum into 40 1/3 octave bands.
6. IMPEDANCE SETTING Displays 4 or 8 Ω. Set on the rear panel to match the speaker's nominal impedance.
7. AVERAGE POWER POINTER Tracks the amplifier's average (RMS) power output.
8. PEAK POWER POINTER Tracks the amplifier's peak power output.
9. PEAK POWER OUTPUT IN WATTS Displays the numerical value of the amplifier's peak power output.
10. RELATIVE PEAK POWER OUTPUT Displays the amplifier's peak power output relative to its rated output.
11. AVERAGE POWER OUTPUT Displays the numerical value of the amplifier's average power output.
12. RELATIVE AVERAGE POWER OUTPUT Displays the amplifier's average power output relative to its rated output.
13. FREQUENCY OUTPUT DISPLAY Shows the amplifier's output level in 1/3 octave frequency bands.

REAR PANEL LAYOUT



Rear Panel Layout

1. **BALANCED (XLR) Input jack**
2. **POSITIVE (+) BINDING POST (WBT type).** Connect positive speaker wire for one speaker to this post.
3. **SECOND POSITIVE (+) BINDING POST.** Connects positive speaker wire to the second positive speaker terminal when Bi-Wiring. When Bi-Wiring, please be certain to remove the jumper between the woofer and high-frequency section of the loudspeaker.
4. **SPEAKON LOUDSPEAKER OUTPUT.** Connects CHANNEL ONE output to the appropriate loudspeaker.
5. **NEGATIVE (-) BINDING POST (WBT type).** Connect negative speaker wire for one speaker to this post.
6. **SECOND NEGATIVE (-) BINDING POST.** Connects negative speaker wire to the second negative speaker terminal when Bi-Wiring. When Bi-Wiring, please be certain to remove the jumper between the woofer and high-frequency section of the loudspeaker.
7. **120 VOLT INDICATOR.** A GREEN MARK here indicates the amplifier is to be connected to a 120V circuit. Use with 220 to 240V will damage the amplifier.
8. **220 TO 240 VOLT INDICATOR.** A GREEN MARK here indicates the amplifier is to be connected to a 220 to 240V circuit. The amplifier will not operate if used with 120V and may be damaged in the process.
9. **METER RANGE SWITCH.** Adjusts power indications on the meter. Set to 8Ω or 4Ω depending on the impedance of the speakers hooked-up to the amplifier.
10. **CHANNEL ONE MAIN POWER SWITCH AND MAGNETIC CIRCUIT BREAKER.** Disconnects AC to Channel One. It is recommended that this be left ON at all times during regular use with the exception of whenever cables are connected/ disconnected or when the unit is not going to be used for an extended period of time. In the rare case where amplifier protection is needed, this switch may turn the unit off.
11. **AC POWER INLET.** Use the included power cords to connect Channel 1 to an appropriate AC power source.
12. **FAN ON/OFF SWITCH.** The SAE 2HP-D is designed for convection cooling. Where convection cooling is not sufficient or the amplifier is used for sustained high-power operation, set the fan to ON.
13. **STANDBY REMOTE TRIGGER JACK.** With the main power switch(es) set to ON, when the rear panel **STANDBY TRIGGER** jack receives a 5-12 VDC signal the amplifier(s) will exit the Standby mode and turn on. When the signal is removed, the amplifier will return to Standby.
14. **GROUND TERMINAL.** Use to interconnect component chassis when necessary.
- 15/16. **DUPLICATES ITEMS 10 and 11 for Channel Two.**
17. **FAN OUTLET.** Forced air used for cooling exits the amplifier here.
18. **SERIAL NUMBER.** Shows the unit's serial number.

OPERATION

Before turning on the 2HP-D, ensure that all precautions and warnings have been carefully reviewed and adhered to. Damage to the amplifier caused by improper operation, wiring and/or ventilation will not be covered under warranty and SAE will not be liable for any consequential damage or loss.

Connecting your 2HP-D

With the 2HP-D's rear panel main power switches turned off, connect the signal outputs of the preamp/processor to the balanced input of the amplifier. Connect the output to the input of the speaker that is intended to be driven. Please refer to figure 5.

The 2HP-D has a second binding post output connector. This may be connected to the second speaker input terminal on your loudspeaker system (if available). If using this second speaker input terminal, please be certain to remove the metal jumper between the woofer and high-frequency sections of your speaker.

Connect a 12V trigger source to the **STANDBY** trigger input of the 2HP-D to enable remote turn-on and turn-off.

Setup and Operation

Turn the output volume of the preamp/processor, or other source device, down all of the way.

Turn on 2HP-D's **MAIN POWER** switches, located on the rear panel.

When the end of the switch with | indicating "ON" is depressed that half of the amplifier is in the STANDBY mode. When in standby, the amplifier draws less than 1 watt from the wall outlet.

Touch the front-panel power button. Both the switch and the SAE logo illuminate. After a wait of about 45 seconds, the soft-start turn-on sequence is complete and the amplifier is ready for use.

Slowly bring the output volume of the preamp/processor up to an audible level.

Remote Triggers

When the rear panel **STANDBY** trigger jack receives a 5-12 VDC signal, the 2HP-D will change its state from standby to operate. When the signal is removed, the amplifier will return to **STANDBY**.

Appendix A Troubleshooting Guide

If the 2HP-D should function abnormally during operation, please review the items in the following checklist. Please be sure to thoroughly check all other connected components such as speakers and preamplifiers, as well as cables. If the problem persists, please consult your dealer or distributor.

Symptom	Possible Cause(s)	Remedy
No power or front panel lights and no sound.	The power cable is not inserted 100% into AC input connector.	Ensure that the AC cord(s) are fully inserted into the amplifier and that the wall outlet is active.
	Circuit breaker is open (AC outlet).	Check the AC outlet circuit breaker and reset, if necessary, or contact your dealer.
No audio output.	Overheating, DC at output, Catastrophic failure	The amplifier will turn off with the rear panel switch indicating O. For any but a catastrophic failure, the amplifier can be reset by removing the fault and completing the turn-on sequence again.
Warm	Normal operation	
Hot	Normal operation	Use rear-panel switch to turn-on the fan.

Appendix B Specifications

Analog Audio Inputs	One Balanced (XLR) jack per channel
Input Impedance	47 k Ohms. Balanced for each phase
Input Sensitivity	2.82V RMS input for 600W into 8 ohms
Gain	27.8 dB
Polarity	Balanced; Pin-2 = Positive, Pin-3 = Negative for Non-Inverting Output
Speaker Outputs	WBT Low-Mass Binding posts 4 per channel; One 4-Pole Speakon connector per channel
Modes /Process	Standby: Amplifier is ready to be turned on via front panel switch or remote trigger. Overcurrent, D.C., and/or thermal protection: Amplifier will cycle. Catastrophic D.C. or output stage failure: Amplifier will shut down.

Power Output

Per Channel, All Channels Driven	8 ohms	4 ohms	2 ohms
20 Hz-20 kHz, < 0.01% THD	600 WRMS	1200 WRMS	1200 WRMS
1 kHz, 0.01% THD, (Watts)	746 WRMS	1350 WRMS	1350 WRMS
1 kHz, 0.01% THD, (HP)	1 HP	1 ¾ HP	1 ¾ HP
1 kHz, 1% THD	860 WRMS	1400 WRMS	2000 WRMS
CEA 2006 1 kHz Burst Power	1100 WRMS	2000 WRMS	3400 WRMS

Distortion

THD + N, 20 Hz—20 kHz	0.01%	0.01%	0.01%
THD + N at 1 kHz			
At Rated Power	0.005%	0.006%	0.008%
At 10W	0.0015%	0.003%	0.003%

Intermodulation Distortion

(SMPTE or Twin-tone) Less than 0.01%

Frequency Response +0, -3dB, 5 Hz to 150 kHz, 8 Ω

Damping factor >600 at 100 Hz;

Signal to noise ratio 128 dB referenced to rated output (A-Weighted)

Slew rate >60V per microsecond

Crosstalk > 110 dB

Power Requirements 117V AC, 50/60 Hz or 230V AC, 50/60Hz depending on version

Power Consumption Less than 1W x 2 at Standby; 1800W maximum x 2

Trigger Input 3-24 VDC; Steady State

Dimensions (WxHxD) 19" x 8¾" x 20" add 1" for feet and 1½" for connectors; 483 mm x 222mm x 508 mm
Add 25.4mm for feet and 38mm for connectors.

Weight 127 lbs; 57.6 kG

90 DAY LIMITED WARRANTY TERMS AND CONDITIONS (7-Year Optional Extended Service Contract)

SAE Limited Warranty

Terms and Conditions

All SAE products are warranted against defects in materials and workmanship for 90 days from the date of purchase by the original owner. The date of purchase shall be established by the original owner presenting to the SAE Customer Service Facility the original owner's purchase receipt or sales slip showing from whom the product was purchased, the date of purchase and the purchase price of the unit.

In the event that proof of purchase cannot be established as stated in the preceding sentence, the warranty period shall commence on the date of manufacture, provided the serial number on the unit has not been altered in any manner.

During the warranty period, SAE will repair, or at its option, replace at no charge, components that prove to be defective provided the product is returned in accordance with the shipping instructions that are contained in the unit. The unit is to be sent PREPAID in the original carton and packing along with a detailed description of the problem to SAE in the event it needs factory servicing. SAE will return it prepaid to you upon completion of the service.

Optional Extended Warranty Program

The standard 90-Day Limited Warranty will be extended to a 7-Year Limited Warranty (on all Power Amplifiers) if the following conditions are met:

The SAE product is purchased from an authorized SAE reseller. The customer completes the registration card. The customer returns the completed registration card AND copy of original bill of sale to SAE within 14 days of purchase.

This extended warranty is transferable to subsequent purchasers as long as all Optional Extended Warranty conditions are met.

Transferability

The above warranties are transferable to subsequent owners as long as all the conditions are met under the Optional Extended Warranty Program. The warranty is not transferable if the unit(s) was originally purchased from an unauthorized seller.

The above warranties do not apply if the product has been damaged by accident or misuse or as a result of modification by other than the SAE factory service facility.

SAE shall not be held liable for incidental or consequential damages of any kind arising from the sale or use of its products. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THERE ARE NO WARRANTIES GIVEN BY SAE THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. ALL IMPLIED WARRANTIES OF FITNESS FOR PURPOSE SOLD, MERCHANTABILITY, DESCRIPTION, QUALITY PRODUCTIVENESS OR ANY OTHER MATTERS ARE LIMITED TO THE TERM OF THE EXPRESS WARRANTIES HEREIN STATED.]

Some states do not allow limitations on how long an implied warranty may last, so the above limitation may not apply to you.

Obligation to Make Changes

Products are sold on the basis of specifications applicable at the time of sale. SAE shall have no obligation to modify or to update products once sold. This warranty gives you specific rights and you may also have other rights that vary from state to state. This warranty is applicable only in the United States.

Warranty Outside the United States

SAE has formal distribution agreements in many countries. The SAE importer in those countries has assumed the responsibility for servicing SAE products. Please contact the dealer or distributor in the country where you purchased your product for service issues.

(844) 4HEARSAE
info@hear-sae.com
www.hear-sae.com