Performance Series
OWNERS MANUAL

CONTENTS

MODEL 4, 5, 8

INTRODUCTION

ESS Performance Series speakers are among the most efficient Heil air-motion transformer loudspeakers available; all feature a 10″ passive radiator tuned to optimize the bass response in their respective system; all speakers provide the tonal clarity characteristic of Heil air-motion transformer systems; all are superb instruments meant to last a lifetime with proper care. We urge you to read this Owner's Manual carefully. It will familiarize you with speaker connection procedures and placement options. The manual also includes background material on the ESS Performance Series components and their characteristics. We hope that this information and the pleasure you derive from your new speaker system will meet and exceed your expectations.

CONNECTING YOUR SPEAKERS

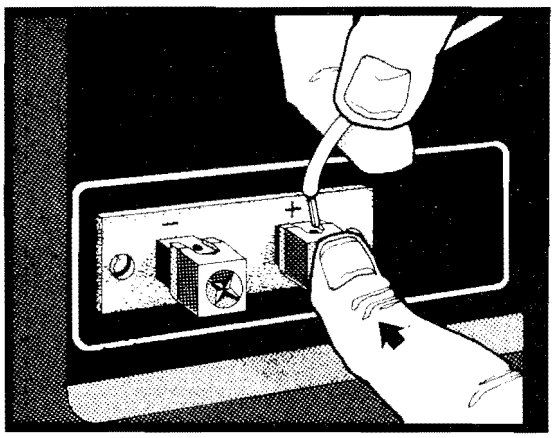
Follow the steps below to ensure that your ESS Performance Series speakers are properly connected to your electronics. Connecting the speakers will be easy. However, because minor errors in the connection procedure can diminish the performance of your speakers and electronics, we urge you to follow these directions carefully:

- Turn your electronics off while connecting the speakers to avoid any possibility of damage by shorting.
- If you plan to drive more than one pair of speakers simultaneously with your stereo receiver, or if you plan to drive more than four speakers with a 4-channel unit, turn to "Multiple Speaker Connection."
- You were probably supplied with wire to connect the speakers to your electronics at the time of purchase. We recommend 18-gauge lamp cord (commonly called "zip" cord) if the speaker will be 25 feet (7.5 m) or less from your electronics. Use of thinner wire (larger gauge number) than 18 gauge is not recommended under any circumstances; 16 gauge cord is strongly recommended for speaker placement in excess of 25 feet from your electronics.

- The "Left" and "Right" designations on the speaker output terminals of your amplifier or receiver refer to the speakers *as you face them*. Thus the Left Channel output of your receiver should be connected to the speaker on your left, and the Right Channel output from the receiver should be connected to the speaker on your right.

It is very important that the positive ("+") and negative ("−") posts of your electronics connect properly to the corresponding speaker posts.

All double-strand wires are coded to ensure that ground ("−") and positive ("+") wire can be identified throughout the length of the cord. Examination of solid-colored cord will reveal one or more ridges along one side of the insulation. It is standard to connect the rigid side to the negative (BLACK) terminal. The wire with smooth insulation should connect to the positive (RED) terminal at the amplifier and to the positive terminal on the corresponding speaker. Cords with clear plastic insulation generally have wire of two different colors for identification — usually copper and silver. Copper connects to the negative terminal, silver to the positive terminal.



INPUT TERMINAL CONNECTION

- The ternimal posts at the rear of your ESS Performance Series speakers require that you strip about ¼″ (7 mm) of insulation off the end of the connecting wire. The connection to your amplifier or receiver will probably also require that the wire be similarly stripped for a short length. NO PORTION OF THE STRIPPED CONNECTING WIRE AT THE SPEAKER OR AMPLIFIER TERMINALS SHOULD TOUCH THE OTHER WIRE. Shorting of speaker leads at the speaker or amplifier can damage your equipment. Be sure that the wires at your amplifier and speakers are properly isolated.
- Press the spring-loaded clamp at the terminal posts of the speakers to insert the stripped wire into the terminal. Release the clamp to lock the connecting wire firmly to the terminal post. Once the leads are connected from electronics to speakers, your system should be ready to turn on.

PHASING: If your speakers seem to image poorly or if the bass seems inadequate, it is possible that they have inadvertently been connected OUT OF PHASE. To check for proper phasing, follow this procedure:

- Switch your receiver or preamplifier to the MONO mode. Select a program source and position yourself equidistantly in front of the speakers. If the sound seems to emanate clearly from between the two speakers, they are properly phased. However, if you hear a broad vague sound which leaps from side to side as you move your head off center, your speakers are out of phase. The problem can easily be corrected by reversing the connection to ONE of the speakers. Switching to stereo should reveal the dramatic, natural sound that you have come to expect of proper stereo imaging.

SPEAKER PLACEMENT

A speaker's room placement and its orientation to the listener can have a major bearing on the quality of sound you hear. The proper functioning of the passive radiator at the *rear* of the model 5 & 8 requires that these speakers be placed *no closer than one inch from the wall.* Maximum bass performance will probably occur with the speaker placed 3 to 5 inches from the wall. Because the passive radiator is located in the front of the model 4, that speaker may be placed directly against a rear wall. Aside from not placing the models 5 or 8 directly against the rear wall, you will probably want to experiment with room placement if your room and furnishings do not limit placement possibilities.

Generally, optimal stereo imaging is obtained by placing both speakers along one plane, parallel to each other about five to eight feet apart. If the speaker is a bookshelf configuration, placing the speakers on the floor, near corners, will augment bass response but might tend to make the bass "overpower" the rest of the speaker. If the bass seems excessive, try moving the speaker away from the corner or try elevating the speakers a few inches off the floor.

The furnishings in your room can also importantly affect how your speakers sound. Large windows, paneled walls and wooden floor and/or ceilings are characteristic of "live" rooms. Ideally, highly reflective surfaces are acoustically optimized by opposite absorptive surfaces. Heavily draped, upholstered and carpeted rooms lacking any reflective surfaces tend to be acoustically non-reverberant or "dead". Rooms with a balance between reflective surfaces tend to be most acoustically ideal. If possible, experiment with speaker and decor placement to obtain a sound quality that you find pleasing.

COMPONENTS

MIDRANGE/HIGH FREQUENCY:
The Heil Air-Motion Transformer

Unlike the Performance Series Heil driver, conventional midrange and high frequency drivers are highly susceptible to diaphragm resonance. When a cone, for instance, is driven at certain frequencies, it begins to change shape "in sympathy" with the drive frequency. This vibration, known as diaphragm resonance, absorbs energy, blunting transient attack and causing overhang. Moreover, when another signal is introduced at the same time the resonating diaphragm tightens up, like a rubber band stretched between two points. This forces the resonating frequency to rise in frequency. This change in frequency is a major factor in "masking" clarity due to pitch variation.

One way to avoid resonance is to make the diaphragm absolutely rigid. Unfortunately, this entails making the diaphragm massive and difficult to drive.

A more effective way to avoid resonance is found in the concept of distributed drive. When a driving force is distributed uniformly over a diaphragm's moving surface area, it supports the diaphragm; the diaphragm is thereby effectively made rigid without extra weight. Resonant vibrations simply do not occur.

The diaphragm of the Heil air-motion transformer incorporates both concepts. Its surface area is folded into deep vertical pleats. Conductive aluminum strips bonded to the pleat walls move with the electronic signal, causing the pleats to close or open along their entire length.

As the pleats expand or contract, air is sucked in or forced out the open end. The pleat walls move only one fifth as far as the escaping air, thus reducing the possibility of flexing. The air-motion transformation ratio is thus 5 to 1.

The Heil's pleat action has two major advantages over conventional methods. First, it eliminates the possibility of diaphragm resonance. Since the Heil's pleat walls are totally drive-supported by the aluminum strips, they cannot bend out of shape to go into resonance. Second, when the Heil's deep pleats force the air out, they move the air much farther — and faster — than they themselves move — creating a large, high velocity air motion from a short, precise diaphragm movement.

This is important because it drastically reduces the effective moving mass of the diaphragm. The Heil builds up only a fraction of the momentum generated by conventional one-to-one drivers, transferring energy to the air efficiently at all frequencies.

The Heil transformer's pleated configuration has the added advantage of spectacular dispersion by virtue of its small radiating source. Conventional speakers reproducing similar frequencies are usually so wide by comparison that sound waves from one side of the disphragm interfere with waves on the other side, narrowing the speaker's clean output to a constricted central beam. This makes speaker placement extremely critical. The Heil air-motion transformer avoids this side cancellation because of its compact configuration. With a 120° horizontal pattern of 20,000 Hz, the Heil maintains a solid expanse of stereo imagery to frequencies beyond audibility. A spacious sound stage can be enjoyed from virtually any point in the listening field.

Definitive clarity, freedom from resonance, and full-range sound dispersion — the inherent benefits of superior design. For conventional speakers, they remain problematic goals.

LOW FREQUENCY DRIVER

Different low frequency transducers are used in ESS Performance Series speakers to complement cabinet size and the Heil air-motion transformer. Each woofer utilizes a magnetic circuit that critically damps the drivers moving assembly and makes possible a flat frequency response over an extended range. The model 4 woofer operated from 35 Hz to the crossover point at 2400 Hz into the Heil amt. The range of the slightly less massive model 5 and 8 bass drivers operate from 40 Hz and 50 Hz respectively to the crossover point of 2400 Hz.

THE PASSIVE RADIATOR

The 10" passive radiator on your ESS Performance Series speaker is driven by the motional energy of the woofer. The passive radiator works in the same way as a port except that the velocity of the passive diaphragm is much lower than that of the air moving through a typical port. As a result, *low frequency distortion is lower when using a passive radiator system than when using a ported system.* In order to have the same performance from a vent, the port would have to occupy the entire volume of a typical bookshelf system! Additionally, the passive radiator keeps the back radiation of the woofer where it belongs: in a tuned system within the box.

SPECIFICATIONS

FULL SYSTEM	**MODEL 4**
Power Capacity	160 Watts (clean power)
Nominal Impedance	6 Ohms
Dispersion	120° horizontal, 40° vertical
Crossover Frequency	2400 Hz
Efficiency	1 Watt input produces a 96 dB of sound pressure at a distance of 3 feet, 82 dB at 15 feet
Amplitude-Frequency Response	35 Hz to 24 kHz ± 3 dB
HEIL AIR-MOTION TRANSFORMER	
Total Radiating Area	10.4 sq. in. (67.1 cm^2)
Transformation Ratio	5.3 to 1
Magnet Assembly Weight	2¼ lbs. (1.02 kg)
Flux Density	6,000 Gauss
Square Wave Rise Time	15 Microseconds @ 5 kHz
LOW FREQUENCY DRIVER	
Nominal Diameter	10 inches (25.40 cm)
Flux Density	11,800 Gauss
PASSIVE RADIATOR	
Nominal Diameter	10 inches (25.40 cm)
DECOR	
Finish	Vinyl (Walnut)
Grille Color	Dark Brown
Dimensions	35 x 12½ x 12⅛ in. (88.9 x 31.75 x 30.8 cm)
WEIGHT	
(Including Packing)	48 lbs. (22 kg)

NOTE: In the model 5 and 8 speaker systems you can tune your passive radiator to a lower frequency by moving the rear of the speaker enclosure closer to the wall. Maximum bass performance will probably occur with the speaker placed 3 to 5 inches from the wall.

Under no circumstances, should the passive radiator be put closer than one inch from the wall; since it will reduce its effectiveness dramatically, and may result in the passive radiator's hitting the wall when making its most extreme excursions.

FREQUENCY DIVIDING NETWORK

Optimal performance of the drivers used in your ESS Performance Series speakers is assured by a sophisticated 18dB per octive crossover. Rugged, highest quality components integrate the woofer and the Heil air-motion transformer at a crossover point of 2400 Hz and provide absolute freedom from phase interference in the midrange.

MODEL 5	**MODEL 8**
140 Watts (clean power) 6 Ohms 120° horizontal, 40° vertical 2400 Hz 1 Watt input produces a 95 dB of sound pressure at a distance of 3 feet, 81 dB at 15 feet 40 Hz to 20 kHz ± 3 dB	100 Watts (clean power) 6 Ohms 120° horizontal, 40° vertical 2400 Hz 1 Watt input produces 94 dB of sound pressure at a distance of 3 feet, 80 dB at 15 feet 50 Hz to 20 kHz ± 3 dB
10.4 sq. in. (67.1 cm^2) 5.3 to 1 2¼ lbs. (1.02 kg) 6,000 Gauss 15 Microseconds @ 5 kHz	10.4 sq. in. (67.1 cm^2) 5.3 to 1 2¼ lbs. (1.02 kg) 6,000 Gauss 15 Microseconds @ 5 kHz
10 inches (25.40 cm) 9,500 Gauss	8 inches (20.3 cm) 9,000 Gauss)
10 inches (25.40 cm)	10 inches (25.40 cm)
Vinyl (Walnut) Dark Brown 24⅛ x 14 x 14 in. (61.3 x 35.6 x 35.6 cm)	Vinyl (Walnut) Dark Brown 22 x 12¼ x 10⅝ in. (55.9 x 31.1 x 27 cm)
36 lbs. (17 kg)	30 lbs. (14 kg)

THE IMPORTANCE OF "CLEAN" AMPLIFIER POWER OUTPUT

The power rating on your ESS Performance Series loudspeaker represents the maximum amount of *clean* power which the loudspeaker will handle indefinitely.

Typical recorded music has peaks about 10dB higher than the average level of the music — unless clipping is allowed to occur. Once clipping begins three bad things happen:

1) Low frequency energy intended for the woofer is converted to high frequency energy which ends up in the tweeter.
2) The average power increases without increasing the peak power.
3) The level of distortion increases dramatically.

An amplifier in light to moderate clipping delivers as much power as an amplifier with 25 to 50 percent greater power output not driven into clipping.

All ESS Professional Series loudspeakers are tested with clean power exceeding the rating of the speaker. Be assured then that if your amplifier is within the power rating of your speaker and distortion is occurring it is your amplifier that is being overdriven *not* your speaker.

Amplifier power ratings are typically based on an 8 ohm impedance. Typically an amplifier will deliver 25% more power to a 6 ohm speaker and about 50% more power to a 4 ohm speaker. Please check the impedance rating on your speaker in the "Specifications" section to determine the actual power capability of the amplifier you will be using with the speakers.

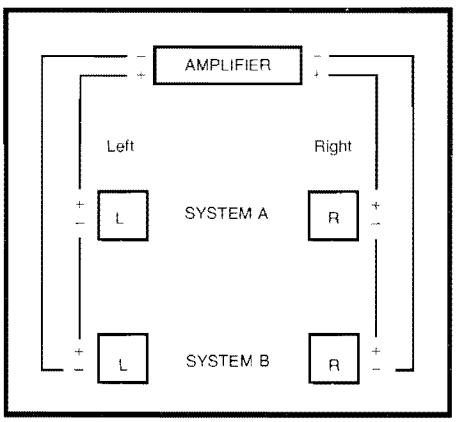
As a general rule, most popular receivers will clip at about "1 o'clock" on the volume control playing into an ESS Performance Series speaker system. If your amplifier or receiver has power output meters, it is not advisable to exceed meter readings of 0 Vu.

Driving the loudspeakers with sine wave signals at high dB output levels is *not* advisable. Driver failure from excessive input levels, faulty electronic equipment, or owner neglect will not be covered under the conditions of the warranty. Used properly, the rugged, reliable components in your ESS Performance Series speaker system should provide a lifetime of outstanding service.

MULTIPLE SPEAKER CONNECTION

ESS Performance Series speakers have an impedance of 6 ohms. Most receivers and basic amplifiers have no difficulty whatsoever with impedance loads above 4 ohms, but can develop problems if the load drops below 4 ohms. Connecting an additional set of speakers to your Tempest will probably drop the system impedance below 4 ohms; consequently, they should not be connected in parallel. If you own a receiver, driving your speakers in the A & B mode with another set of speakers might drop the system impedance below the 4 ohm level.

A second set of speakers may be connected IN SERIES. Series connection keeps the system impedance *above* 4 ohms, assuring that your electronics will handle the load properly. Your dealer can help to clarify and answer any questions you may have about multiple connections to your speakers. Switching boxes are also available which simplify series connection; your dealer can help you obtain such a box. The basic series connection is diagrammed below and should be used if you plan to connect another set of speakers to your ESS Performance Series speakers.



SERIES SPEAKER CONNECTION

Connections of additional speakers to a basic 4-channel configuration will also require connection IN SERIES. You may use the diagram above as a model for this procedure. If you have a question, it is wise to contact your dealer or the manufacturer of your 4-channel receiver.

Once you understand the ramifications and procedure of connecting multiple speakers, return to "Connecting Your Speakers."

HEIL ROTATION FOR HORIZONTAL PLACEMENT

The Heil air-motion transformer in your ESS Performance Series speaker is mounted for optimal performance in the upright, vertical position. If you plan to lay your model 5 or 8 speakers on their longest side in the horizontal "bookshelf" position, then the Heil amt may be rotated 90° in the following manner to optimize dispersion.

- Place the speaker on its back. Remove the grille from its fasteners by gently pulling the top and bottom of the grille upward, away from the fasteners on the front of the speaker.
- The air-motion transformer is attached to the front mounting panel of the speaker by four screws. Remove the screws and rotate the Heil amt assembly 90°. Refasten the transformer with the four screws and carefully reattach the grille.

Your ESS Performance Series dealer should be most willing to rotate the amt or provide further instructions if you feel reluctant to undertake the rotation procedure.

CABINET CARE

Your ESS Performance Series loudspeakers require no more care than that normally given fine furniture. The beauty of the vinyl surface may be retained and enhanced with a vinyl treatment like "Armoral." Silicone dusting sprays and strong abrasive compounds should not be used on the vinyl surface of the speaker.

SERVICE

The dealership where you purchased your ESS Performance Series speakers can best verify any complaint you may have and can arrange for any necessary servicing.

If your dealer cannot be contacted, please write ESS, Inc. Attention: Customer Services, and include the following information:

- The model and serial number of your speakers.
- The dealer from whom your speaker was purchased, the date of purchase, and, if possible, your phone number.
- A specific description of the problem.
- Associated equipment (including RMS power ratings of your amp) used with the speakers.

If ESS deems return to the factory necessary, please ship freight prepaid and be sure to use the "Authorized Return" labels which ESS will provide. Once repaired, your unit will be returned freight prepaid.

LIMITED THREE-YEAR WARRANTY

When ESS Performance Speakers are used in accordance with the written instructions contained in the Owner's Manual, ESS will repair any defect in workmanship and materials that occurs in normal use for a period of 36 months from the date of original purchase without charge for parts or labor. The warranty applies only to the original owner and is contingent upon purchase from an authorized dealer, except where prohibited by law. The owner's responsibilities are to provide proof of purchase and transportation to the ESS factory authorized service facility in the event that repair is required.

If your speakers are removed from the country of original purchase, ESS Performance Series distributors and/or authorized dealers in any subsequent country are not obligated by the terms of this warranty. Any repairs under the terms of this warranty will be made at the discretion of the distributor or dealer.

This warranty is void if the serial numbers have been removed or defaced, or if repair has been attempted by any unauthorized person or agency. In addition the warranty does not cover tampering, abuse or accidental damage. The right is further reserved to re-adjust prices or design parameters and specifications without notice and without incurring responsibility to modity previously purchased systems. ESS specifically excludes from this warranty any responsibility for consequential damage.

Retention of your ORIGINAL BILL OF SALE is required to obtain service under the terms of the warranty. Any card or other form of registration does not constitute proof of purchase and will not be regarded as such. During the three year warranty period, only presentation of your ORIGINAL BILL OF SALE to either an authorized warranty station or the factory itself will insure your rights under the warranty policy described above.

IMPORTANT

ESS is constantly researching new materials, production methods and design refinements which may be introduced into existing product lines without notice or obligation. For this reason, any current ESS Performance Series product may differ in some respect from its published description but will always equal or exceed performance of the original design.

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