



Electrostatic Stereophones

for total high-fidelity
and full stereo geometry
THE SOUND OF KOSS



KOSS

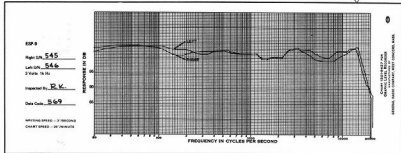
KOSS ELECTRONICS, INC / 2227 NORTH 31ST STREET, MILWAUKEE, WISCONSIN 53208

KOSS ELECTRONICS S.r.l., VIA BELLINI 7, 20054, NOVA MILANESE, ITALY / CABLE: STEREOFONE



Uses
Electrostatic Principle
For Ultimate Performance
And Total Comfort

MACHINE RUN RESPONSE
CURVE OF THE MODEL ESP-9



ELECTRICAL SPECIFICATIONS

Frequency Response Range, Typical: 15-15,000 Hz \pm 2 db (10 octaves) 10-19,000 Hz \pm 5 db. An individual, machine-run calibration curve accompanies each headset.

Sensitivity: 90 db SPL at 1kHz \pm 1 db referred to 0.0002 dynes/cm² with 1 volt at the input. Variations from calibration furnished are less than 1/2 db at 25°C.

Total Harmonic Distortion: Less than .2% at 110 db SPL. **Isolation From External Noise:** 40 db average through fluid-filled cushions provided as an integral part of the headset.

Power Handling Capability: Maximum continuous program material should not exceed 10 volts (12 watts) as read by an ac VTVM (Ballantine meter 310B or equal) with average indicating circuitry and rms calibrated scale; provides for transient peaks 14 db beyond the continuous level of 10 volts.

Source Impedance: Designed to work from 4-16 ohm amplifier outputs. At higher impedances response at the extremes of the frequency range will progressively reduce; e.g., 50 ohms causes a loss of 5 db at 30 and 10,000 Hz.

External Power Requirements: None, except when used for precise low level signal measurement, when external ac line can be selected by a front panel switch on the E-9 Energizer (1/16 amp, 117 VAC, 50-60 Hz normally; 234 VAC with internal strap for foreign use).

E-9 Energizer: Contains 2 coupling transformers, self-energizing circuitry, speaker/headphone transfer key-switch and ac pilot light on black anodized front panel. Also contains ac power transformer, ac on-off switch, ac line fuse, and speaker terminals. Size is 4-1/2" h x 3-3/4" w x 6-1/4" d; weight 3 pounds. Has 6' 4 conductor input cable terminated with 4 spade lugs to connect to amplifier output terminals.

PHYSICAL SPECIFICATIONS

Size of Cup: 4-1/4" h x 3-3/4" w x 1-1/4" d.

Cushions: Fluid filled for high ambient noise isolation.

Headband: Extendable, stainless steel bands with self-adjusting pivoting yokes; conforms to any head size.

Headband Cover: Formed of wide, soft molded-rubber with 1/2" polyethylene sponge cushion on underside.

Boom Mount for Microphone: Knurled, anodized, aluminum knob on left cup with threaded shaft and 2 compressible rubber washers; accepts all standard booms.

Headset Cable: Flexible, polyvinyl, 5 conductor, shielded, 6' long, black, with 5 prong plug keyed to E-9 Energizer receptacle.

Weight of Headset Only: 19 ounces

Accessory Provided: 6' ac line-cord P/N 41-0235 for optional use, with plug on one end and plug-receptacle on the other.

ordering information

Model ESP-9 Studio Monitor: Electrostatic Stereophones, complete with E-9 Energizer, ac line-cord, machine-run calibrated response curve and instructions; Shipping weight 6 pounds; Price

\$150.00

model esp-9 studio monitor

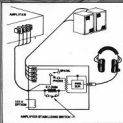
Offers a new tool for improved audiometry with self-bias or ac line energizing. Controlled monitoring with 10 octaves ± 2 db range exceeding best loudspeaker systems. Eliminates all room reflections and polar distribution problems.



Rear view of the E-9 Energizer.



Functional Block Schematic showing switching functions and wire-up of the ESP-9.



NEW!

- **SUPER, WIDE-RANGE RESPONSE** for critical, controlled monitoring of finest recording sources. Delivers all 10 audible octaves, 15-15,000 Hz ± 2 db, 4 octaves beyond ordinary headphones.
- **VIRTUALLY DISTORTION-FREE PERFORMANCE** through precision electrical balancing of push-pull acoustical circuitry to give fatigue-free listening through long, intense recording sessions. Elements cancel all 2nd harmonic distortion, unlike conventional units.
- **LIGHTWEIGHT-HUMAN ENGINEERED FOR COMFORT**— Uses fluid-filled cushions for distributed gentle pressure with good seal; coupling transformers and circuitry located in external housing; extendable stainless steel headband with wide cushion for perfect fit and restful listening.
- **CALIBRATED, PRECISELY CONTROLLED OUTPUT—IDEAL FOR AUDIOMETRIC USES**— Switch on front panel of energizer selects ac operation for precision measurements of output; in self-energized switch position no connection to ac lines is required; this gives maximum convenience.
- **HIGH-POWER CAPABILITY IN VERY LOW BASS RANGE**—Large, oversize coupling transformers mounted in E-9 energizer unit give good wave form at 30 Hz with up to 10 volts input.
- **NO SPECIAL AMPLIFIERS REQUIRED—CONNECTS TO LOW-IMPEDANCE SPEAKER TERMINALS**—Easy, quick hook-up to any good amplifier delivers performance to specification.

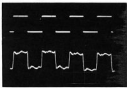
The ESP-9 is a refinement of the famous ESP-6 Electrostatic Stereophones. The most important new feature is a response range of 10 octaves, the **widest ever attained in a headset**. A new cup design promotes virtually linear response to below 20 Hz.

The ESP-9 has a signal handling capacity of 10 volts at 30 Hz with good wave form versus 6 volts for the ESP-6. This is made possible by increasing the size of the coupling transformers by a factor of 4, and mounting them externally to the cup in the E-9 Energizer.

The E-9 Energizer offers the option of self-energizing for the bias supply, or energizing through the ac line; choice is made with a selector switch on the front panel. When energized through the ac line, very precise level measurements can be made. Thus the unit is ideal for audiometry, and for evaluating the spectral character of very low level noise in equipment like tape mastering machines and recording consoles. In contrast to the ESP-6 and ESP-7, both cups are independently energized; a left cup signal is not required to supply bias to the right cup.

TYPICAL SQUARE WAVE RESPONSE AT 400 Hz.

Trace at top is input, lower trace is ESP-9; note unusually close resemblance.



how Koss electrostatic headphones work

And Why They Are So Much Better Than Ordinary Headphones

Regular headphones use a relatively heavy copper voice coil attached to one side of a miniature loudspeaker cone, or diaphragm. The coil is suspended in a magnetic field and acts like a pulsating motor when the electrical counterpart of the music energy flows through its windings. This causes the diaphragm to move the air more or less in conformance to the original sound waves from the musical instruments. Ideally, the moving parts should act like a piston, but the heavy voice coil lags the electrical energy, and the parchment or plastic cone, lacking infinite stiffness, departs from the true piston action and breaks up to deform the sound wave. See Fig. 1.

The advantages of electrostatic elements over conventional drivers have been known for 40 years, and awaited only the availability of modern lightweight and strong diaphragm material to allow them to function reliably. Observe that the moving diaphragm is suspended between two acoustically transparent metal plates. Instead of working in a magnetic field, a static electrical field is employed. This static field controls the motion of the entire diaphragm. With regular drivers, just the center portion or apex of the cone is controlled, and this results in diaphragm breakup and distortion. See Fig. 2.

HOW THE KOSS SELF-ENERGIZING STATIC FIELD WORKS

The static charge, like the magnetic flux, causes a change in the condition of the space in the area of movement, but consumes no energy. So Koss, unlike other manufacturers who use cumbersome ac power supplies, simply establishes the static field by using the very first alternating signal pulse to charge the membrane after putting it through a tiny rectifier diode to charge it to dc. The static charge leaks off into the air very slowly. Even when all signals have been turned off, the sensitivity of the driver decreases only 1 db in six minutes.

HOW ALMOST PERFECT BASS RESPONSE IS ACHIEVED

It is a scientific fact that a pressure operated driver like the Koss Electrostatic element will deliver flat bass response to below audibility if it plays into a sealed cavity. The Koss fluid-filled cushions promote nearly perfect seal around the ear. Therefore the bass range in Koss Electrostatics is limited only by the size and quality of the coupling transformers.

HOW THE TREBLE RANGE IS SMOOTHED

Above the normal system resonance of 1500 Hz the wavelengths of the sound become smaller than the diaphragm, tending to reinforce at times, and to cancel at others. Koss scientists have carefully developed acoustical networks to control and flatten treble response so smooth, fatigue-free listening results.

THE UNUSUAL ACCOMPLISHMENT OF THE LAST HIGH OCTAVE

Almost all quality headphones play well in the region 8,000 - 16,000 Hz except when placed against the ear. This is true because the diaphragm to ear cavity acts as an acoustical shunt for these small wavelengths, allowing the ear to hear only one-tenth or less of the energy from the headphone that is actually there. With a profound grasp of the bio-acoustical problem involved, Koss engineers have calculated the deficiency and restored proper hearing levels. This is achieved by resonating the element capacity with the coupling transformer reactance, an exclusive Koss exploitation of electro-acoustical effects.* See Fig. 3.

HOW TO INTERPRET SQUARE WAVE RESPONSE

The importance of good square wave response has been well established as a means of checking smooth, wide-range, frequency response along with the ability to reproduce transient signals cleanly. Before the advent of Koss Electrostatic Headphones, it was virtually impossible to achieve even the resemblance of a square wave. Attention is called to the square wave photographs accompanying each of the ESP specifications, Fig. 4.

HOW KOSS FREQUENCY RESPONSE MEASUREMENTS ARE MADE

The USA Standard for calibrating headphones (Z24.9 - 1949) admits to being an arbitrary reference of restricted range, and bearing only small relationship to what the ear actually hears. To measure with greater meaning the extended response of Koss Electrostatic units, the Koss improved coupler design can be employed with the standard equipment shown to duplicate the response charts in these pages. See Fig. 5.

*Patent Pending

Figure-1



Figure-2

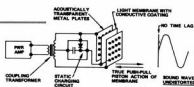


Figure-3

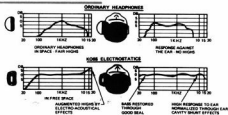


Figure-4

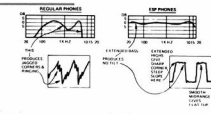
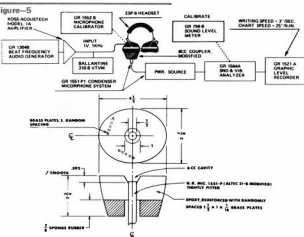


Figure-5



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