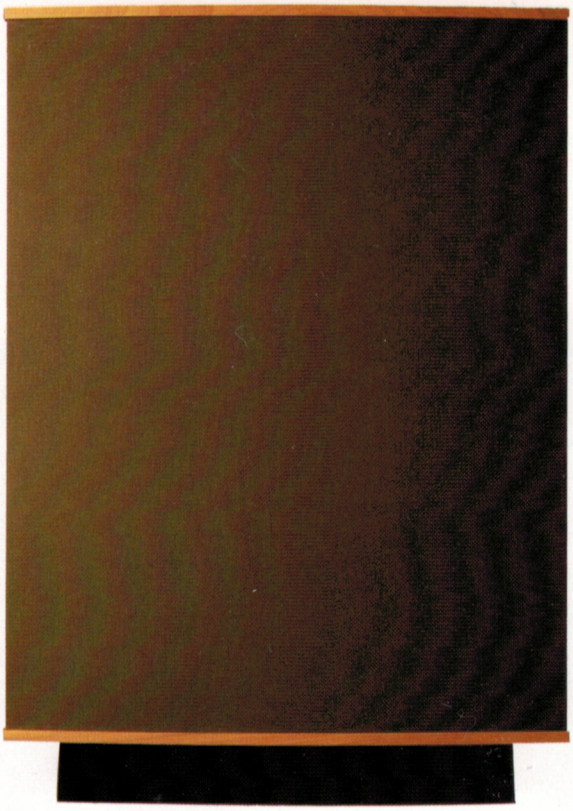

QUAD
ESL-63



THE QUAD

For a quarter of a century the Quad electrostatic loudspeaker has remained as a standard of reference for engineers working in recording, broadcasting and loudspeaker design and a source of pleasure to those fortunate enough to own a pair.

The introduction of its successor, the Quad ESL-63 is an event of considerable significance to both listener and engineer, destined to have an important influence upon the quality of reproduction which we can expect in the future.

Electrostatic loudspeakers

Because they are expensive and not widely distributed a great deal of mystery still surrounds the electrostatic loudspeaker.

The idea of a relatively large light membrane acting directly upon the air and driven over its entire surface in a controlled manner is intuitively very attractive and work was done on electrostatic loudspeakers well before Rice and Kellogg invented the moving coil loudspeaker.

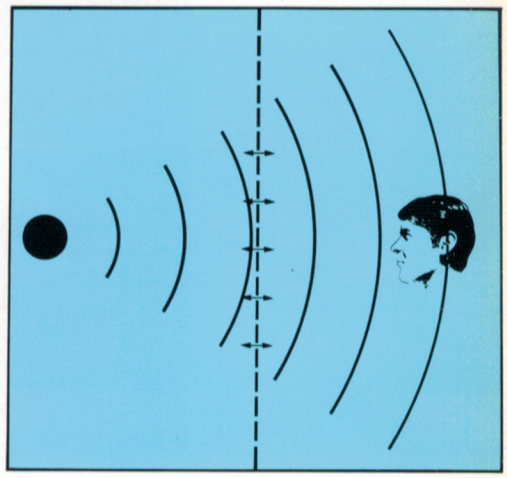
We are all familiar with electrostatics. Few of us have not sat in idle moments at school toying with torn up pieces of paper and a pen rubbed vigorously on the sleeve, or experienced the results of discharging the considerable voltage that can be built up on the body in a dry atmosphere with synthetic carpets underfoot.

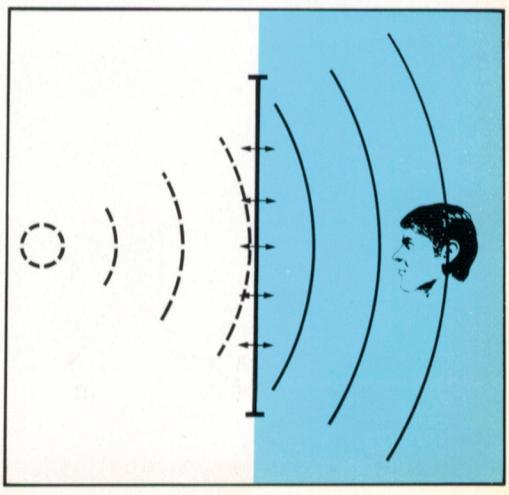
An electrostatic loudspeaker consists of light thin membrane on which is placed a charge, suspended between two acoustically transparent, (i.e. with holes), electrodes. When a signal is fed to the electrodes a field is generated between them and the charged diaphragm compelled to move by the same force which causes the piece of paper to move towards the charged pen. Reversing the polarity of the signal on the electrodes causes the diaphragm to move in the opposite direction and thus sound pressure is generated.

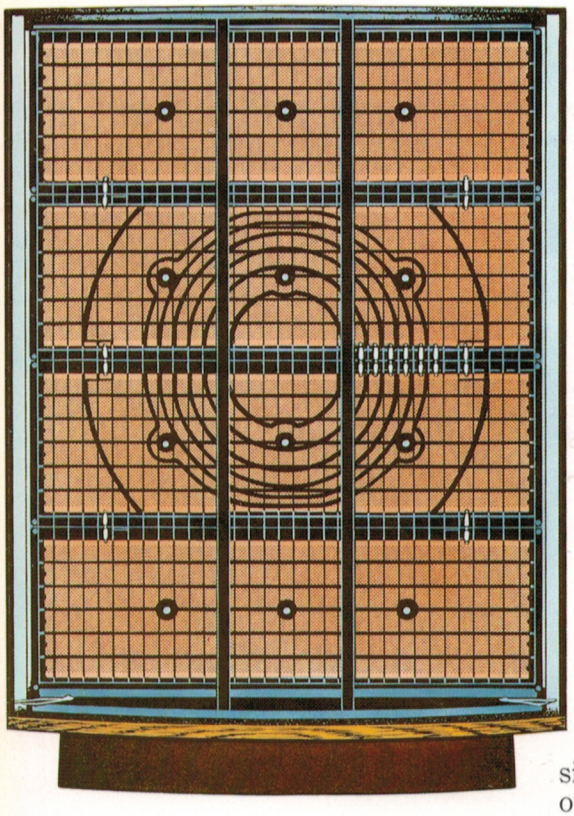
The electrostatic loudspeaker has several inherent advantages. Since the diaphragm is driven over its whole surface it does not need to be stiff and can be made extremely light and thus have negligible stored energy. Because of the good impedance match with the air it is not necessary to load the loudspeaker into a box and the problems associated with cabinet resonance disappear. Designing and manufacturing electrostatic loudspeakers is by no means easy but the potential is there for a higher degree of performance than with conventional loudspeakers.

Until now every loudspeaker designer, moving coil or electrostatic, has coped with the problem of achieving a desired dispersion characteristic over the full frequency range in much the same way, multiple drive units of similar or varying sizes, with or without crossovers.

The Quad ESL-63 achieves its desired dispersion pattern in a totally different manner.







ESL-63.

Imagine a theoretically ideal point source loudspeaker radiating sound pressure waves and a plane in the air a short distance from the source at right angles to the direction of propogation. Were we able to make the air at the plane visible we should see concentric waves radiating out from the centre, as if we had just thrown a stone into a still pool.

If we replace the plane with a very light membrane, induce it to reproduce the air particle motion already observed and suppress the original source, the results to a listener on the far side are absolutely indistinguishable from those of the ideal source.

The Quad ESL-63 does exactly this.

It consists of a diaphragm suspended between two sets of concentric annular electrodes. Signal is fed to the electrodes via sequential delay lines and the diaphragm motion produces a sound pressure pattern which is an exact replica of that from an ideal source placed some 30 cms behind the plane of the diaphragm. The ESL-63 is a totally homogeneous sound source, phase true and very aperiodic with a frequency response both on and off axis quite free from the irregularities which are inevitable with any multiway loudspeaker system.

The designer has complete control over the directivity of the loudspeaker and the mean spherical radiated energy is tapered smoothly at higher frequencies.

The Quad ESL-63 is a dipole source, hence its affectionate acronym FRED (full range electrostatic doublet). A dipole source has significant benefits in terms of both room placement and stereo perception. With a sound dispersion pattern which resembles a figure of eight, a dipole radiates no energy in the plane of its diaphragm and does not excite room modes whose axes lie in this plane. In practice the loudspeakers are normally placed at an angle to the horizontal axes of the listening room and excitation of both horizontal axial modes is 3dB less than with an omnidirectional source while the vertical modes are discriminated against. The ratio of direct to reflected sound is much greater with a dipole source, giving much improved localisation of the stereo image.

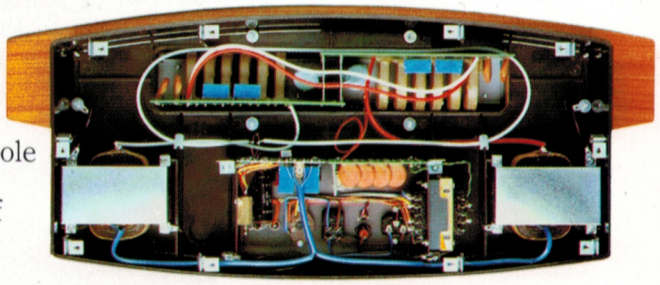
The nett result is a loudspeaker of unsurpassed accuracy which given the right programme material will produce a more realistic and satisfactory illusion of a live musical performance than has previously been possible.

Development of the Quad ESL-63 has taken many years, (there are no prizes for guessing what 63 stands for), and much of the time has been spent in investigating and experimenting with new materials and production techniques, the result of which has been that variations due to manufacturing tolerances have been virtually eliminated, sample variation being held to within less than ± ½dB and stability of the materials used is such that the performance will be maintained for the loudspeaker's useful life without the need for regular maintenance.

Amplifier requirements and loudspeaker protection

The impedance characteristic of the loudspeaker is nominally 8Ω and largely resistive, presenting no problems at all to the amplifier, but amplifiers which are not short circuit protected must not be used with this loudspeaker. The amplifier should have an output capability of 40V peak (100 watts into 8Ω). Amplifiers with output capability of up to 55V peak (190 watts into 8Ω) can be used, but to no advantage.

The loudspeaker is fitted with two protection circuits, one which limits the maximum input voltage fed to the loudspeaker and the other which detects fault conditions and instantaneously shorts the signal being fed to the loudspeaker. It is impossible to damage the loudspeaker elements, but the input voltage limiter has limited thermal capacity and persistent overdrive will overheat it.



Programme material

A small note of caution. We believe that these loudspeakers give a more realistic picture of an acoustic event than has ever been possible before, but the excellence of the Quad ESL-63 will only be revealed if the very best source material is used. Conversely they are very revealing of faults in recording techniques and perhaps it is as well that the first customers for these loudspeakers have been recording and broadcasting companies.

THE **QUAD** ELECTROSTATIC LOUDSPEAKER ESL-63.

Specification

Dimensions	Height 92.5 cm Width 66 cm Depth 27 cm including 15 cm base
Weight	Nett 18.7 kgs. Gross 23 kgs.
A.C. Supply	240/200V 120/100V 50-60Hz 5VA
Impedance	8Ω nominal
Sensitivity	1.5μbars per volt referred to 1M. (i.e. 86dB/2.83Vrms).
Maximum Input	Continuous input voltage 10Vrms Programme peak for undistorted output 40V̂ Permitted peak input 55V̂
Maximum Output	2 N/m² at 2m on Axis
Directivity Index	125Hz 5dB 500Hz 6.4dB 2kHz 7.2dB 8kHz 10.6dB
Axis Band limits (Low level)	−6dB at 35Hz 3rd order −6dB >20kHz.

QUAD

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for the closest approach to the original sound

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