The Poly-Planar speakers employ a lightweight acoustic panel supported by a frame of compatible plastic material to reproduce a wide range of frequencies. There is also a minimum of piston motion resulting in low distortion and high electromagnetic efficiency. The unique construction of this electromagnetic loudspeaker provides a combination of characteristics not available from conventional cone speakers or equivalent designs.

ADVANTAGES OF THE POLY-PLANAR

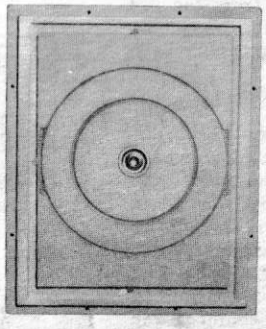
- **Wafer-thin construction permits new design and installation ideas.**
- **Wide-range performance — low distortion.**
- **Rugged — meets extremes of shock and vibration.**
- **Wide temperature operating range: —20°F to +175°F.**
- **moisture-proof.**
- **Easily incorporated into present equipment.**
- **Priced competitively with conventional loudspeakers.**
- **Bi-directional polar pattern.**
- **High-power capability.**
- **Lightweight.**
- **Ideal for consumer, industrial or military applications.**
- **Completely replaces the conventional cone speaker.**

POLY-PLANAR P-20

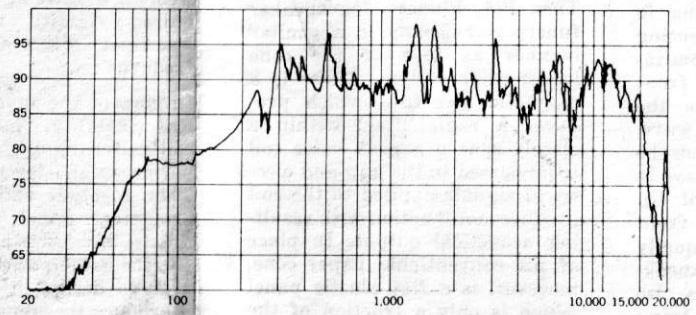
20-WATT WAFER-TYPE SPEAKER

SPECIFICATIONS

Model designation: P-20 Poly-Planar
Power capability: 20 watts peak
Frequency range: 40 cps — 20 KC/S
Sensitivity: 85 DB/M for 1 watt electrical input
Input impedance: 8 ohms
Operating temperature range: —20°F to +175°F
Size (WxDxL): 1-7/16" x 11-3/4" x 14-11/16"
Weight: 19 ounces



FREQUENCY RESPONSE, *POLY-PLANAR P-20 (unbaffled)*

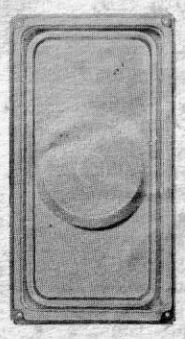


POLY-PLANAR P-5

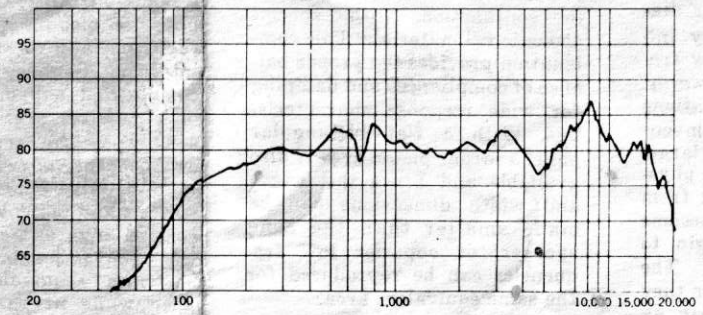
5-WATT WAFER-TYPE SPEAKER

SPECIFICATIONS

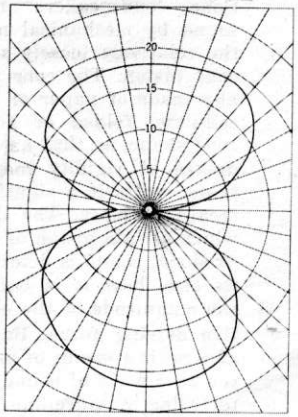
Model Designation: P-5 Poly-Planar
Power capability: 5 watts peak
Frequency range: 60 cps — 20 KC/S
Sensitivity: 80 DB/M for 1 watt electrical input
Input impedance: 8 ohms
Operating temperature range: —20°F to +175°F
Size (WxDxL): 13/16" x 4-1/2" x 8-1/2"
Weight: 10 ounces



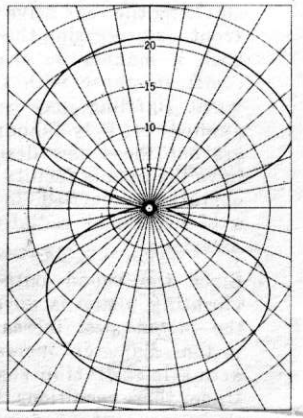
FREQUENCY RESPONSE, *POLY-PLANAR P-5 (unbaffled)*



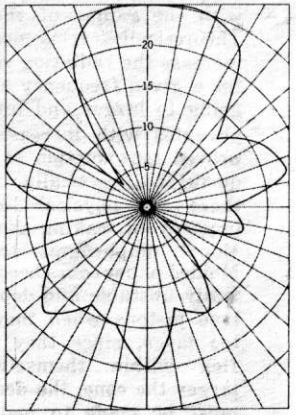
DIRECTIONAL CHARACTERISTICS
Poly-Planar P-20
(unbaffled)



1,000 cps



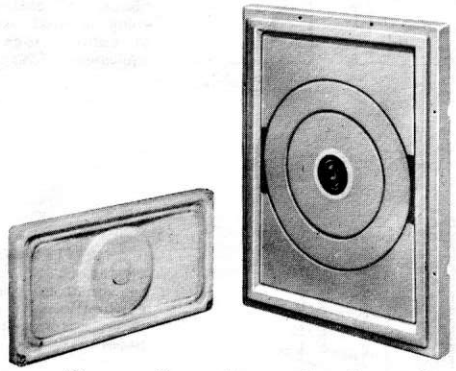
100 cps



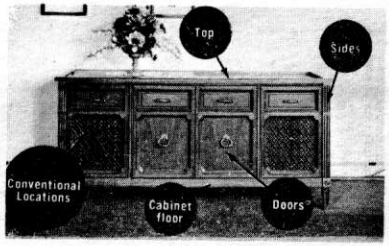
10,000 cps

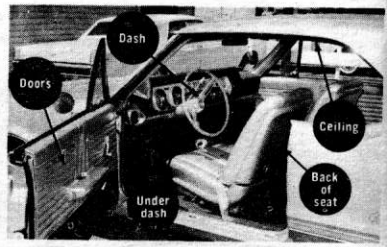
poly-planar

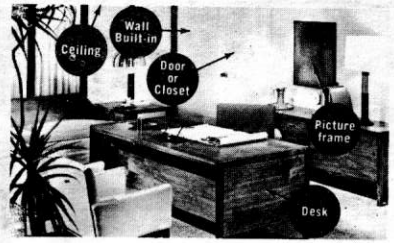
WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER

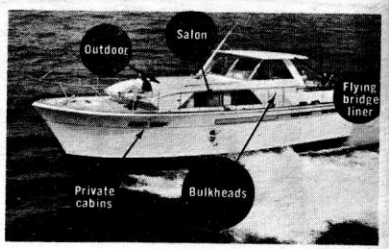


Replaces Cone Speakers in Any Application









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Acoustical Division ELECTRONIC RESEARCH ASSOCIATES, INC.

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Poly-Planar Wafer-Type Speaker

General Information

Cone loudspeakers reproduce sound by mechanical motion of the relatively loosely suspended cone piston. The cone is generally made of paper or prepared cellulose, folded or formed to cone shape, so that an adequate degree of rigidity may be obtained without a significant increase in mass. The degree to which a rigid piston of this type produces sound is determined by its size, how it is baffled and the magnitude of the electromotive driving force. Baffling in general is a means of preventing the rear wave of sound from interfering or cancelling the front wave. Baffling may take the form of absorbing the rear wave, shielding the rear wave from the front, or processing this wave in such a manner so that it becomes in phase with the front wave. Baffling may be equally applied to Poly-Planar speakers but these new designs also have the unique facility of being operated unbaffled to provide a bi-directional radiating characteristic.

Since the sound output of a vibrating piston is governed by the piston size, increasing the piston diameter increases the acoustic radiation resistance. Under these conditions the acoustic power output for a given frequency will vary directly with the radius of the piston. Theoretically, it is possible to increase the radiation resistance for a given frequency at will by going to larger and larger diaphragms with increasingly improved reproduction at low frequencies. Practically, however, there are physical limitations imposed on making the conventional diaphragms too large. Molded paper cones become physically unstable and depart from true pistons when they become too large, since they begin to flex within themselves. The larger the cone, the deeper they must be made to maintain an acceptable measure of mechanical stability. In order to improve on the mechanical stability, it is necessary to utilize reinforced cones, and this increases the mass and decreases the output, not only at low, but also at the higher frequencies. With its accompanying heavy magnet structure the large size cone type speaker becomes excessively bulky, deep and heavy. The resulting structure, even if successful, is both difficult and expensive to manufacture.

Poly-Planar Design

The Poly-Planar loudspeaker functions basically in a similar manner as that of the cone loudspeaker system. There is a magnetic structure which produces a radial field within a closely spaced gap. A voice coil is immersed in the gap and electrical signals applied to the coil produce motor action with resulting acoustical output. In place of the conventional paper cone, however, is a flat plastic panel which is only a fraction of the depth of the equivalent cone structure. This panel is made rigid by the choice of plastic materials in conjunction with a special surface skin treatment. The material used is expanded polystyrene in a compacted bead structure. Since the beads are largely air, the mass is extremely low. As an example, the weight of a typical ⅛" acoustic panel is less than 0.2 grams per cubic inch. To obtain the desired acoustic properties the panel incorporates a combination of circular grooves in conjunction with special acoustic fill materials. This combination provides the proper balance of compliances and damping for wide response characteristics. With a flat rectangular panel a larger piston area is also available and hence the length and width dimensions can be made smaller than the cone speaker, or superior low frequencies can be reproduced for the same equivalent area.

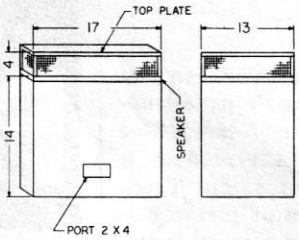
In view of the superior rigidity of the acoustic panel, conven-

tional "spiders" or supporting structures are not required to maintain or center the voice coil in the magnetic gap. The acoustic panel is supported directly by a frame made of similar polystyrene plastic which provides an identical coefficient of expansion. This results in a stable physical structure substantially independent of wide changes in temperature or ambient conditions. Due to the physical characteristics of the acoustic panel, the supporting frame may also be made shallow without detracting from the required rigidity necessary to prevent flexing at low frequencies.

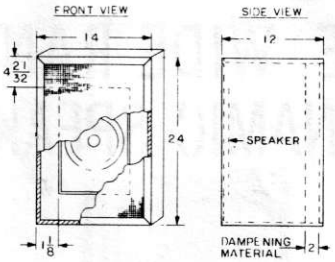
In view of the superior mechanical stability, more accurate coil centering is feasible which permits a shorter magnetic gap. This, together with the smaller acoustical panel mass, allows the use of a lower magnet weight for the same power output. For a given design, it is possible to reproduce the same sound power output with a smaller amount of piston displacement and the magnet thickness can be made thinner without introducing appreciable distortion. The combination of all these factors leads to the unique physical characteristics of Poly-Planar speakers.

One extremely important aspect of the Poly-Planar speaker is that manufacture by automatic machinery is feasible. Both the acoustic panel and supporting frame can be molded at a fast production rate. Magnet assemblies can also be premolded into the frame and voice coils molded into the diaphragm. Since no complicated supporting spiders or structures are required, assembly of the composite unit can be achieved within a minimum of labor time. The end result makes possible substantial cost savings as compared with the conventional loudspeaker system of equivalent performance while at the same time, maintaining superior physical and electrical characteristics.

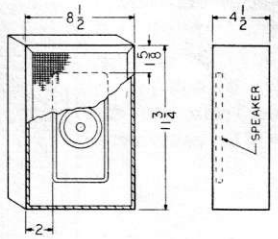
Baffling & Enclosure Recommendations for the P-5 and P-20



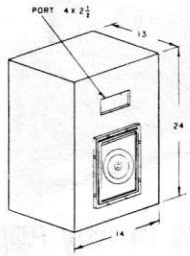
TOP DISPERSION BAFFLE
Novel enclosure serves as table or side piece and provides 360° dispersion. (P-20)



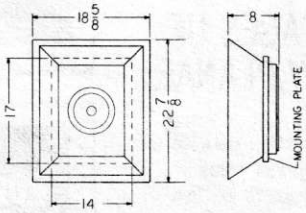
BOOKSHELF ENCLOSURE
"Bookshelf" enclosure dampening material used at rear of cabinet rock wool or equivalent. (P-20)



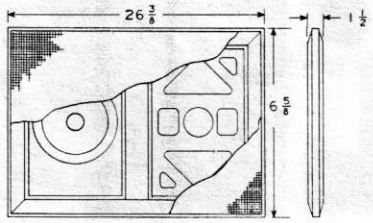
MINIATURE BOOKSHELF ENCLOSURE
Enclosure for smaller speaker unit conserves space and provides a simplified construction design. (P-5)



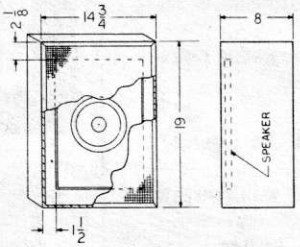
REFLEX SYSTEM
Dimensions of cabinet may be varied to suit particular applications. Size of port determines bass enhancement. (P-20)



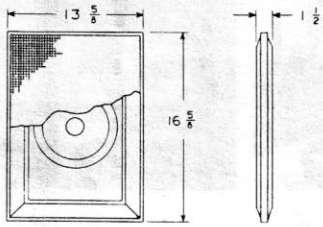
HORN ENCLOSURE
Rectiliner assembly allows the use of plywood or acoustic board panels for construction. Depth of horn may be varied to suit particular acoustic applications. For small units such as P-5 use mounting plate with appropriate aperture. (P-20)



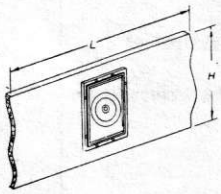
DUAL BAFFLE SYSTEM
Each Poly-Planar acts as a baffle for the other speaker. Units electrically connected either in series or parallel (P-20)



SHALLOW BOOKSHELF ENCLOSURE
Shallow Enclosure design which eliminates rear dampening material (P-20)



SINGLE BAFFLE SYSTEM
Single Poly-Planar mounted in a one inch wide frame. (P-20)



INFINITE BAFFLE
Dimensions L & H as large as feasible. Baffle as small as a several inch surround is still effective, however. Multiple connected units may also be mounted in the same baffle. Aperture size should be adjusted to speaker dimensions. (P-20)

Baffling enclosure designs for either model (P-5 or P-20) may be used for the other by revising dimensions to accommodate.