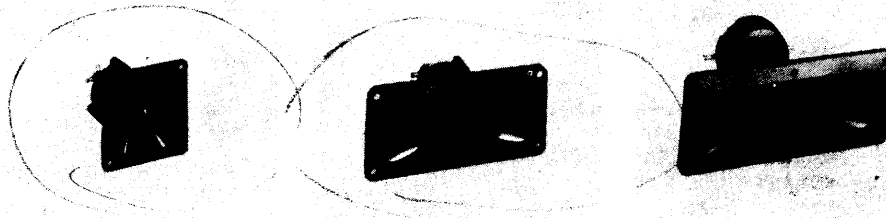


MOTOROLA INC. PIEZOELECTRIC TWEETERS

FEATURES:

- Low Harmonic Distortion
- Can Be Used Without X-Over Network*
- Relatively Flat Response From 4,000 Hz - 30,000 Hz
- Converts Electrical Energy to Acoustic Energy Efficiently
- No Voice Coil or Magnet Structure Means Extremely Light in Weight
- Versatile in Application; Boats, Cars, Hi-Fi, Sound Reinforcement, Musical Instrument, Etc.
- High Efficiency - Approximately 95 dB 1-Watt-1-Meter Referenced at 8 ohm Load
- High Power Handling Capability 28 Watts Continues 153 Watts Max. Referenced at 8 ohm Load



4,000 Hz to 25,000 Hz
3½" Super Horn
KSN1005A
SRC #317

3,200 Hz to 25,000 Hz
2"x5" Horn
KSN1016A
SRC #318

2,200 Hz to 20,000 Hz
2"x6" Horn
KSN1025A
SRC #345

The basic simplicity of the Piezo-Electric Drive mechanism offers many significant advantages to the Motorola tweeters. From a performance standpoint, the elimination of the voice coil results in a lower dynamic mass in the driver, greatly improving the transient response of the speaker. The result is a noticeably "cleaner" sound with low distortion. In considering "ruggedness" of the speaker, the elimination of the air gap removes one significant problem inherent to dynamic speakers. Gone are the problems of contaminants in the gap and warped cones producing rubbing voice coils. Also, the removal of the bulky magnet structure makes for a conveniently sized, light weight unit.

The Piezo-Electric tweeter electrically looks approximately like a 0.15 microfarad capacitor in series with a 15 ohm resistor and thus is a highly reactive load which dissipates little heat energy. It is, however, very efficient at converting electrical energy into acoustical energy and in fact consumes from 15 times less power than a typical, similar size moving coil speaker at 4 kHz. to 5 to 10 times less power at the upper end of its frequency range for the same acoustical output.

The tweeter is of such a high impedance that the amplifier doesn't even recognize it as additional load. The impedance falls with increasing frequency but still exceeds 8 ohms even at 100 kHz. This same falling impedance

characteristic allows the unit to reject low frequency power without the need of a crossover network. This of course not only saves the cost of the network but improves the transient response in the crossover region.

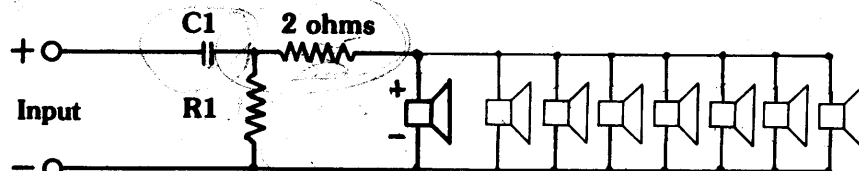
The direct radiating tweeters drive the air directly from the cone while the horn speakers couple the cone to the air through the compression horn. A horn is used in conjunction with a diaphragm loudspeaker for the purpose of increasing the acoustical loading on the diaphragm (over a limited frequency range) and thereby increasing its efficiency. The horn is basically a tapered acoustical transmission line which couples the impedance it sees, looking back into the diaphragm as efficiently as possible to the load it sees looking out of its mouth. It essentially transforms acoustical energy at high pressure and low velocity to energy at low pressure and high velocity.

In order to match the relatively large cone of the driver unit to the small area of the horn neck Motorola has, in the case of the "Superhorn", employed a system of patented computer-generated ribs or convolutions inside a hyperbolic horn to achieve this match without leading the sound around curves and corners, thus eliminating possibilities of sound cancellation. The central rod further helps to achieve the necessary final match to the low impedance of the atmosphere.

It should be noted that paralleling several of these units (each looking like a .15 microfarad capacitor) can add up to a rather large capacitor that may cause instability and ultrasonic oscillation in power amplifiers. For instance, eight units in parallel will be equal to 1.2 microfarads.

* The Motorola piezo-electric tweeters will work without a crossover network. However, it may be desirable or necessary to change the crossover point to the tweeter rather than using the natural point at which the tweeter ceases to operate efficiently.

The low frequency cutoff characteristics of each of these tweeters is determined by the characteristics of the horn (See the specs associated with each model). We have developed networks that will allow selection of different crossover frequencies, using up to eight tweeters in parallel (such as in an array). When using more than eight tweeters in an array it will be necessary to go to series-parallel wiring to insure amplifier stability and flat frequency response. The networks will also eliminate the harshness at high power levels associated with these tweeters. Because the networks are very low impedance compared with the impedance of the tweeters, and because no inductive elements are used, transient response will not be impaired. The two ohm resistor has been added to insure amplifier stability and will not affect frequency response (unless more than eight tweeters are in parallel).



fc (Cutoff)	C1 (mfd.)	R1 (ohm)
2500	3.3	15
3000	4.7	7.5
3500	3.3	10
4800	3.3	7.5
5500	2.2	10
8000	2.2	7.5
10,000	2.2	6
12,000	2.2	5
15,000	2.2	4