

**Electro-Voice®**

a MARK IV company

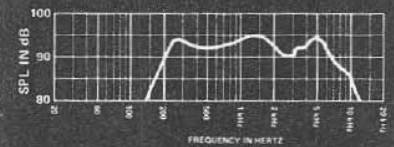


FIGURE 1 - Axial Frequency Response 1 watt/1 meter

# Model LR2SA/LR2SAT All-Weather Line Radiator

## SPECIFICATIONS

Usable Frequency Response, 10 Feet on Axis, Half-Space Anechoic Environment (Figure 1):

200 - 10,000 Hz

Long-Term Average Power Handling Capacity per EIA Standard RS - 426A (see Power Handling Capacity section):

25 watts

Maximum Long-Term Midband Acoustic Output:

.25 watt

Axial Sound Pressure Level at 1 Meter, 1 Watt Input, Anechoic Environment, Band-Limited Pink Noise Signal, 300 - 2,000 Hz:

96 dB

Nominal Dispersion Angle Included by 6-dB-Down Points on Polar Responses, Indicated One-Third Octave Bands of Pink Noise, 1,000 - 10,000 Hz Median, Horizontal (see Figure 3):

100 Degrees

Vertical (see Figure 3):

45 Degrees

Directivity Factor  $R_0$  (Q), 500 - 10,000 Hz Median (see Figure 4):

9.5

Directivity Index  $D_i$ , 500 - 10,000 Hz Median (See Figure 4)

9.8 dB

Transducer Complement:

Three 5 x 7-inch loudspeakers

Impedance,

Nominal:

12 ohms

Minimum:

7.7 ohms

Input Connections:

Screw terminals (#8 - 32) on insulating strip (T1 positive and T2 negative)

Enclosure Materials and Colors:

Fawn metallic finish on extruded aluminum cabinet. Grille is perforated metal in front of a foam water barrier.

Mounting Accessories:

Wall brackets (2), EV Model 460, and Wing Nuts Supplied (See Figure 5)

Dimensions:

62.23 cm (24.5 in.) high

16 cm (6.3 in.) wide

11.9 cm (4.7 in.) deep

Net Weight,

LR2SA:

5.0 kg (11 lbs)

LR2SAT:

5.4 kg (12 lbs)

Shipping Weight,

LR2SA:

7.7 kg (17 lbs)

LR2SAT:

8.1 kg (18 lbs)

## DESCRIPTION

The Electro-Voice LR2SA and LR2SAT Line Radiators™ are "column" format loudspeaker systems intended for indoor and outdoor applications. They contain a vertical array of three 5 x 7-inch elliptical full-range loudspeakers connected together with a special electrical network which effectively shortens the length of the line radiator with increasing frequency. This causes the vertical coverage angle to be more uniform as frequency changes than would be the case with simpler connections. This sophisticated system format means high-fidelity sound quality in conjunction with the forward-directed form of uniform sound coverage associated with a column system. The wide frequency range, relatively high sensitivity (96 dB 1 watt at 1 meter) and 25-watt input capacity further aid in solving difficult sound reinforcement problems. The elongated yet extremely compact size of the system (only 24.5-inches high) additionally makes it inconspicuously fit into many vertically or horizontally-oriented environments. The enclosure is primarily made of a lightweight, weather resistant aluminum extrusion.

The "T" in the LR2SAT model denotes that this model Line Radiator has a universal transformer for 25, 70.7, and 100 volt lines. The transformer is weather resistant and encased in the extruded aluminum cabinet/speaker housing. Power taps from .45 watt to 30 watts are available via a weathersealed screwdriver adjustable switch, recessed in the end plate near the screw terminals for the speaker leads.

## WHY LINE RADIATOR LOUDSPEAKER SYSTEMS?

Line Radiator or column format systems may be thought of as "stretched" or elongated forms of more conventional loudspeaker system shapes. This elongation carries with it several properties which are desirable in certain applications.

The first property involves the directional characteristics associated with elongated acoustical sources. The most efficient applications of Line Radiators are those which take advantage of this characteristic. When mounted vertically, the broad horizontal coverage pattern aids in covering large audiences while the more limited vertical coverage makes projection possible over longer distances without unwanted reflections from floors or ceilings. In addition, when mounted above a sound system's microphone, line radiators are capable of covering the audience without the troublesome acoustic feedback to the microphone which often accompanies less sophisticated reproducers. Since most of the output is projected forward and comparatively little is allowed to come from the ends, a microphone placed under the Line Radiator will receive much less direct sound than if similarly placed with respect to other loudspeakers. This can greatly reduce or eliminate feedback.

Another useful property involves the visual aspects of a Line Radiator. The thin elongated shape often intergrates well into the architecture surrounding it. This is especially true if the architecture has strong vertical or horizontal accents which tend to make the system blend into the surroundings. In some situations, the shape alone may be sufficient reason for selection of this type of system.

## FREQUENCY RESPONSE

The combination of three integrated elliptical loudspeakers and line shortening electrical network results in the wide and smooth overall response shown in Figure 1. The response is 1/3-octave averaged, no external equalization was used.

## DIRECTIVITY

The polar response of the system is shown in Figure 2. These polar responses were measured in an anechoic environment using 1/3-octave pink noise inputs. The frequencies selected are fully representative of the polar response of the system. Beamwidth of the system utilizing the complete 1/3-octave polar data is shown in Figure 3.  $R_{\theta}(Q)$  and directivity index ( $D_i$ ) are plotted in Figure 4.

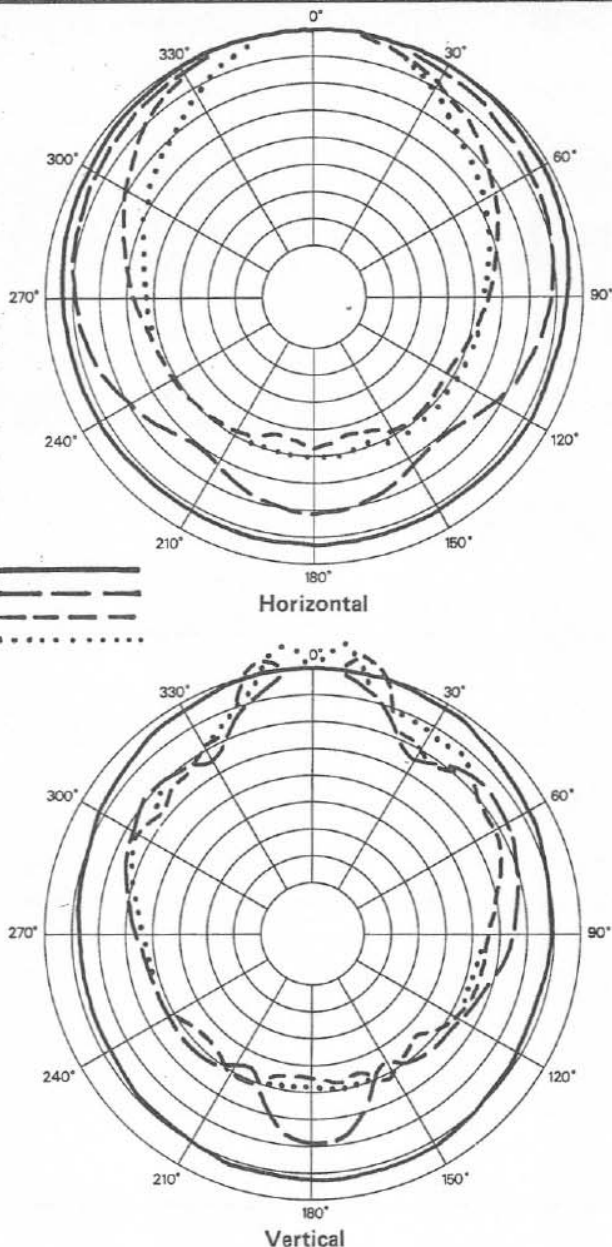


FIGURE 2 - Polars

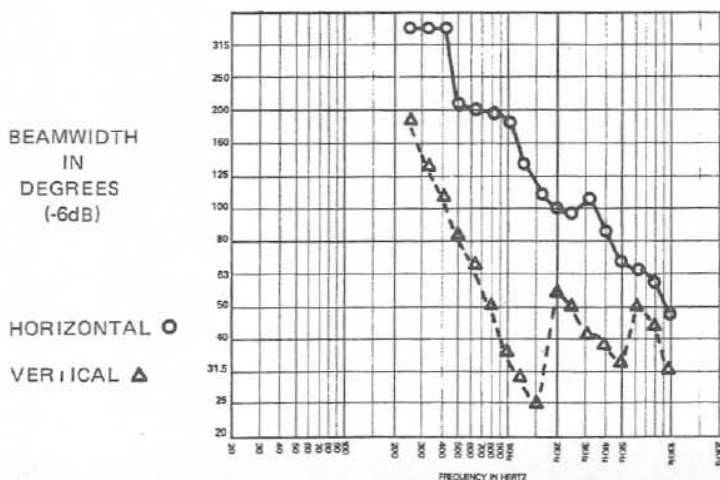


FIGURE 3 - Beamwidth vs Frequency

## POWER HANDLING CAPACITY

To our knowledge, Electro-Voice was the first United States manufacturer to develop and publish a power test closely related to real-life conditions. First, we use a random noise input signal because it contains many frequencies simultaneously, just like real voice or instrument program. Second, our signal contains more energy at extremely high and low frequencies than typical actual program, adding an extra measure of reliability. Third, the test signal includes not only the overall "long-term average" or "continuous" level – which our ears interpret as loudness – but also short-duration peaks which are many times higher than the average, just like actual program. The long-term average level stresses the speaker thermally (heat). The instantaneous peaks test mechanical reliability (cone and diaphragm excursion). Note that the sine wave test signals sometimes used have a much less demanding peak value relative to their average level. In actual use, long-term average levels exist from several seconds on up, but we apply the long-term average for several hours, adding another extra measure of reliability.

Specifically, the LR2SA and LR2SAT are designed to withstand the power test described in the revised EIA Standard RS-426A. The EIA test spectrum is applied for eight hours. To obtain the spectrum, the output of a white noise generator (white noise is a particular type of random noise with equal energy-per-bandwidth in Hz) is fed to a shaping filter with 6-dB-per octave slopes below 40 Hz and above 318 Hz. When measured with the usual constant-percentage bandwidth analyzer (one-third octave), this shaping filter produces a spectrum whose 3-dB-down points are at 100 Hz and 1200 Hz with a 3-dB-per octave slope above 1200 Hz. This shaped signal is sent to the power amplifier with the continuous power set at 25 watts into the 14.1 ohms EIA equivalent impedance (18.8 volts true RMS). Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 100 watts peak (37.6 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

## MOUNTING

The LR2SA and LR2SAT can be easily installed using the two "L" brackets, Electro-Voice Model 460, and hardware supplied (see Figure 5A). The "L" brackets are mounted to surface on which the system is to be mounted such as, wall, ledge, arch or ceiling, and to the opposite ends of system.

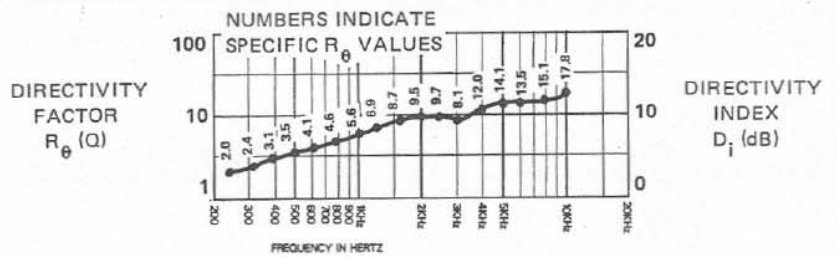


FIGURE 4 – Directivity D<sub>i</sub> (dB)

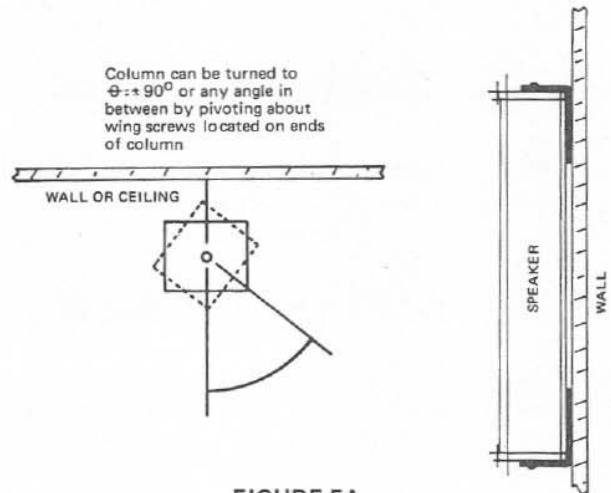


FIGURE 5A

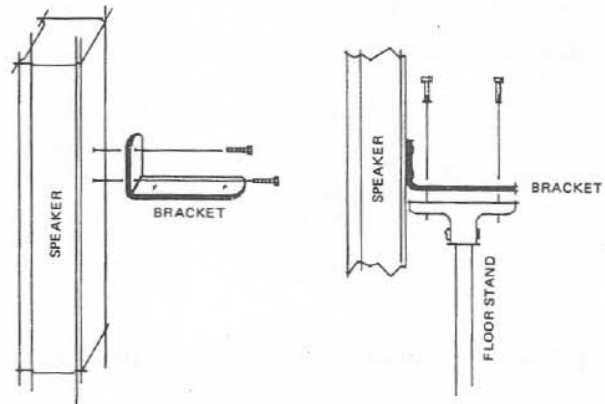


FIGURE 5B Mounting

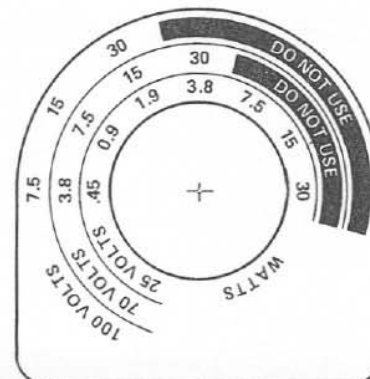


FIGURE 6 – Switch Label

The Electro-Voice Model 460 "L" mounting bracket is also designed to facilitate attachment of the Model LR2SA or LR2SAT to a heavy-duty floor stand. Special expansion type ¼-20 inch nuts have been permanently installed on the rear vertical center line of the LR2SA or LR2SAT.

Four ¼-20 inch bolts are supplied with the "L" bracket. Using two of these, install the Model 460 as shown in Figure 5B. Tighten securely. Install on floor stand as shown in the illustration using the remaining two ¼-20 inch bolts, two ¼-20 inch nuts, and two lock washers.

#### ELECTRICAL CONNECTIONS

**LR2SA:** The nominal impedance of this unit is 12 ohms with an impedance minimum of 7.7 ohms. When connecting multiple units to the same amplifier, the combined impedance should be compatible with the amplifier and not be lower than the minimum value the amplifier is intended to work into.

**LR2SAT:** The LR2SAT, being a transformer input device, has switchable power taps and a universal transformer, making possible use with 25, 70.7, and 100 volt lines. The label surrounding the recessed screwdriver adjustable switch denotes the power settings for 25, 70.7, and 100 volt applications and the impedance involved. In multiple installations, the speakers should be paralleled across a 25, 70.7, or 100 volt line, taking care that the total power consumption (the addition of the wattage power settings on each unit) do not exceed the maximum rated output of the amplifier. See chart for recommended cable lengths for low and high impedance systems to limit line losses to 0.5 dB.

**CAUTION.** DO NOT use a 70.7 volt source with the transformer switch set for 25 volts (30W, 15W, or 7.5W) taps. DO NOT use a 100 volt source with the switch set for 25 volts (30W, 15W, 7.5W or 3.75W) taps (see Figure 6). This can cause damage to the speakers, transformers, and may possibly damage the amplifier. Such connection will also void the warranty.

#### PAINTING THE SYSTEM

1. Roughen surfaces to be painted with a wire brush, coarse steel wool or medium to fine grade sandpaper.
2. Clean surfaces with paint thinner, observing precautions due to flammability of the thinner.
3. Mask grille to avoid painting foam-water barrier behind the grille.
4. If grille is to be painted, it must be removed from the enclosure. To remove the grille: (a) remove end cap on terminal end of enclosure, (b) slide grille-foam-baffle out of the end of the enclosure, (c) separate grille from foam pad, (d) mask nameplate.
5. Using enamel paint (conveniently available in spray cans) apply paint observing paint manufacturer's instructions.

#### ARCHITECTS' AND ENGINEERS' SPECIFICATIONS

The loudspeaker shall be of the straight Line Radiator type, utilizing three 5-inch by 7-inch cone speakers. The speakers shall be housed in an extruded aluminum enclosure with fawn metallic painted finish. A metal grille shall be provided. The Line Radiator assembly shall include an integral electrical filter to reduce effective length of the radiator with increasing frequency. The assembly shall be weather-resistant in nature.

The overall size shall be 62.2 cm (24.5 in.) x 16 cm (6.3 in.) x 11.9 cm (4.7 in.). Frequency response shall be 200 to 10,000 Hz. Nominal dispersion angles included by 6-dB-down points using one-third octave bands of noise shall be 100 degrees (horizontal) and 45 degrees (vertical) in the 1,000 to 10,000 Hz range. Axial sound pressure level at one meter, one watt input under anechoic conditions using 300 to 2,000 Hz band-limited pink noise shall be 96 dB.

**LR2SA:** Nominal impedance shall be 12 ohms and net weight shall be 5.0 kg (11 pounds).

**LR2SAT:** The unit shall have an integral weather-resistant universal transformer with power taps available for selection (25, 70.7 and 100 volt) through the externally available, screwdriver adjustable, weather-sealed rotary switch. Net weight shall be 5.4 kg (12 pounds). The Electro-Voice Models LR2SA and LR2SAT are specified.

#### WARRANTY (Limited)

Electro-Voice Loudspeakers, speaker systems, and accessories are guaranteed for five year from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not cover finish, appearance items, burned coils, or other malfunction due to abuse or operation at other than specified conditions. Repair by other than Electro-Voice or its authorized service agencies will void this guarantee.

For repair information and service locations, please write: Service Dept., Electro-Voice, Inc, 600 Cecil Street, Buchanan, Michigan 49107. (Phone: 616/695-6831) or Electro-Voice West, 8234 Doe Ave., Visalia, California 93277 (Phone: 209/651-7777).

Electro-Voice also maintains complete facilities for non-warranty service of EV products.

Specifications subject to change without notice.



**ELECTRO-VOICE, INC., 600 Cecil Street, Buchanan, Michigan 49107**

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