Electro-Voice®
a gulton company

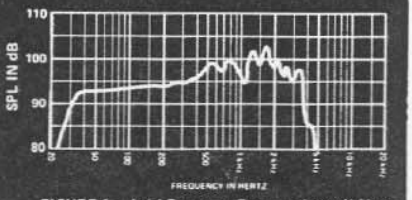


FIGURE 1 – Axial Frequency Response 1 Watt/1 Meter

Model DL18W
Very-Low-Frequency Reproducer

SPECIFICATIONS

Frequency Response:
34 Hz to 3200 Hz ± 3 dB
(Figure 1)

Power Handling:
400 watts (EIA RS-426A)

Impedance (minimum at 230 Hz):
8 ohms

Sensitivity (1 meter, 1 watt averaged),
200–4,000 Hz:
97dB
100–800 Hz:
95dB

Voice-Coil Diameter:
6.35 cm (2.5 in.)

Magnet Weight:
2.2 kg (4.9 lb)

Magnet Material:
Barium ferrite

Color, Frame:
EV light grey

Color, Magnet Thermal Cover:
EV dark red

Dimensions:
See AES Specifications section

Net Weight:
9.3 kg (21 lb)

Shipping Weight:
12.3 kg (27 lb)

Optional Accessories:
SMH-1 mounting hardware kit
XEQ-2 crossover/equalizer

DESCRIPTION

The DL18W very-low-frequency reproducer is an 18-inch, 8-ohm driver designed for professional high-fidelity monitoring and sound reinforcement, especially sub-woofer applications.

At the heart of this speaker is a carefully engineered drive system. Its unique design assures linear, low-distortion output, high power capability and improved heat transfer which reduces thermal dynamic-range compression. The high-excursion drive of the DL18W is augmented by three exclusive Electro-Voice features: the Thermo Inductive Ring, TIR™, the Flux Demodulating Device, FDD™ and PROTEF™ coating. The TIR is essentially an aluminum ring fastened to the pole of the magnet. This acts as a control on drive inductance and, more importantly, provides a major heat-transfer path from the top of the drive coil, normally the primary thermal weakness on other "linear-coil" designs. The FDD is an aluminum ring that encircles both the voice coil and pole piece, and helps to prevent modulation of the magnetic field by the music signal being applied to the voice coil. This dynamic shorting effect considerably reduces distortion in the critical mid-band frequencies. PROTEF is a Teflon-based coating applied to the top plate. Occasionally, violent power peaks of several seconds in duration may expand a normal driver's voice coil into contact with the top plate, causing deterioration. With the PROTEF coating, added protection is provided; the coating lubricates any rubbing contact and provides direct electrical insulation between the coil and the steel top plate. The voice coil itself is constructed of edge-wound rectangular copper wire, mounted on a rugged laminated polyimide form. The complete assembly is fabricated using the most advanced epoxies, insulations and materials available.

Great care was taken in the selection of diaphragm materials and construction to ensure smooth, musical upper bass reproduction and accurate low-frequency shock capability (punch). The DL18W is a true high-fidelity woofer in every sense, being capable of a solid bass response with very low distortion.

DIRECTIONAL PERFORMANCE

The directional characteristics of the DL18W in the TL505 7.1-cubic-foot vented enclosure were measured by running a set of polar responses in EV's large anechoic chamber. The test signal was octave-band-limited pseudo-random pink noise centered at the ISO standard frequencies indicated in Figure 4. The curves show horizontal (side-to-side) dispersion when the enclosure's long axis is vertical. The vertical (up-and-down) polar responses deviate only slightly from the horizontal responses due to box geometry.

Additional typical data is provided in Figures 5 and 6 which indicate 6-dB-down beamwidth versus frequency and directivity factor, respectively, for a DL18W in the TL505 enclosure.

POWER HANDLING TEST

To our knowledge, Electro-Voice was the first U.S. 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 eight hours, adding another extra measure of reliability.

Specifically, the DL18W is designed to withstand the power test described in 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 400 watts into the EIA equivalent impedance (52.5 volts true RMS). Amplifier clipping sets instantaneous peaks at 6 dB above the continuous power, or 1600 watts peak (105.1 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

RECOMMENDED ENCLOSURES

The most extended, lowest distortion and best controlled bass performance is usually realized in properly designed vented enclosures. In such designs, the vent, or port, actually reproduces the lowest octave or so of bass response. The vent is driven to full acoustic output by a relatively small motion of the speaker cone itself, acting through the air contained within the enclosure. The excursion of the DL18W at these frequencies is much reduced compared to a sealed or open-backed enclosure, directly reducing harmonic distortion and the possibility of speaker "bottoming." Several specific vented enclosure recommendations follow, some incorporating low-frequency equalization.

Normally Tuned Enclosures

The 13-cubic-foot TL405 enclosure, tuned to 30Hz, has a low-frequency 3-dB-down point (f_3) of 33 Hz. See figures 1 and 2A. The 7.1-cubic-foot TL505 enclosure, tuned to 32 Hz, has an f_3 of 42 Hz.

Details on enclosure design, construction, and equalization may be obtained from Electro-Voice by requesting "TL405 or TL505 Builders Plan," Form 1547-847 or 1546-487. Please note that the tuning frequencies recommended for the DL18W are not shown on the above plans. However vent dimensions are available from Electro-Voice on request.

Multiple enclosures may also be constructed. For example, a dual TL505 would have twice the internal volume of a single TL505 with the vent area doubled and vent length unchanged. The vent area may be either all-in-one or split into two or more separate vents, as long as the total vent area remains the same.

Step-Down Operation

For extra-low-bass use, the vent area can be reduced by one half, thereby tuning the enclosure to the "step-down" mode. In step-down, the tuning frequency is reduced by one-half octave (a factor of 0.7). The resulting responses are shown for both the 13- and 7.1-cubic-foot enclosures (Figures 2A and B, step-down – no EQ).

With appropriate electronic boost-and-cut equalization (available from the XEQ-2), and the enclosures tuned for step-down operation, approximately one-half octave additional bass response can be obtained, a beneficial extension for many sound reinforcement and playback applications. Below the peak-boost frequency, equalizer response rolls off at 12-dB-per octave, affording a high degree of protection from below-passband inputs which could distort signals within the passband or even damage the DL18W. For the TL405 in step-down, the proper equalization is provided by a second-order underdamped filter with a 6-dB boost frequency of 25 Hz. The resultant f_3 is 24Hz (see Figure 2A). For the TL505 in step-down, the peak boost should occur at 29 Hz, resulting in an f_3 of 30 Hz.

Figures 3A and B depict the impedance curves resulting from the DL18W installed in the 7.1-cubic-foot (TL505) and 13-cubic-foot (TL405) enclosures, in both normal and step-down modes.

Figure 7 shows the maximum acoustic power output versus frequency for the DL18W in the TL505 enclosure. The maximum output is limited by either (1) the thermal power handling capacity of the speaker, or (2) the speaker's maximum linear cone excursion capabilities, whichever occurs first. Note that some maximum acoustic output is sacrificed in the 30 to 80 Hz range (7dB maximum at 35 Hz) in the step-down mode, but that significantly more output is available below about 30 Hz.

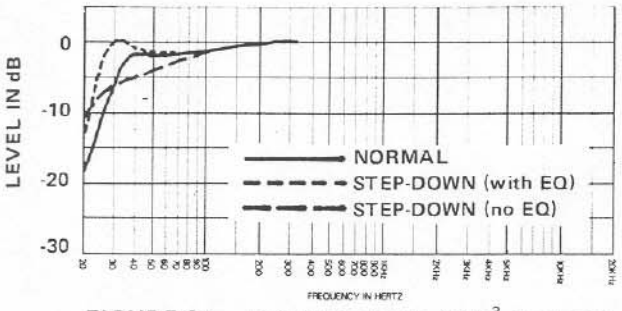


FIGURE 2A – Bass Response in 13-ft^3 Enclosure (TL405)

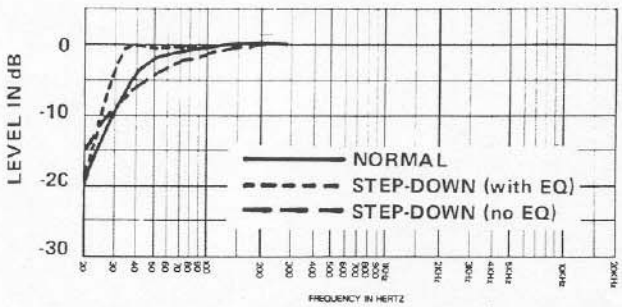


FIGURE 2B – Bass response in 7.1-ft^3 Enclosure (TL505)

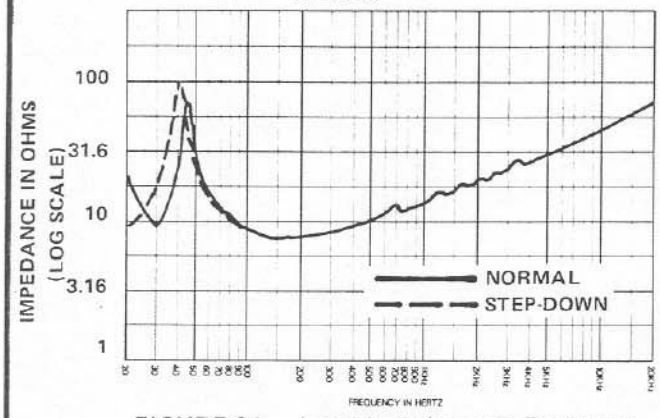


FIGURE 3A – Input Impedance vs. Frequency 13-ft^3 Enclosure (TL405)

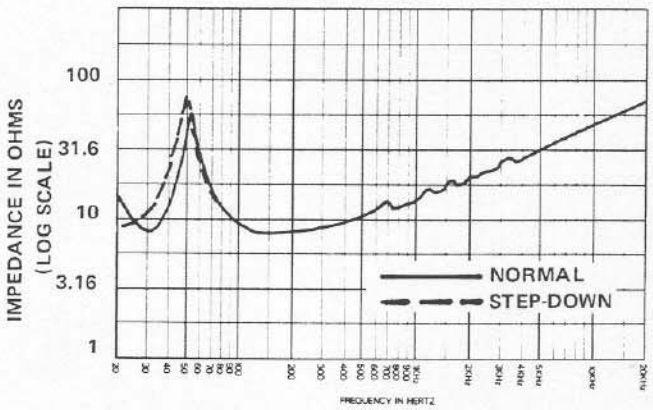


FIGURE 3B – Input Impedance vs. Frequency 7.1 ft^3 Enclosure (TL505)

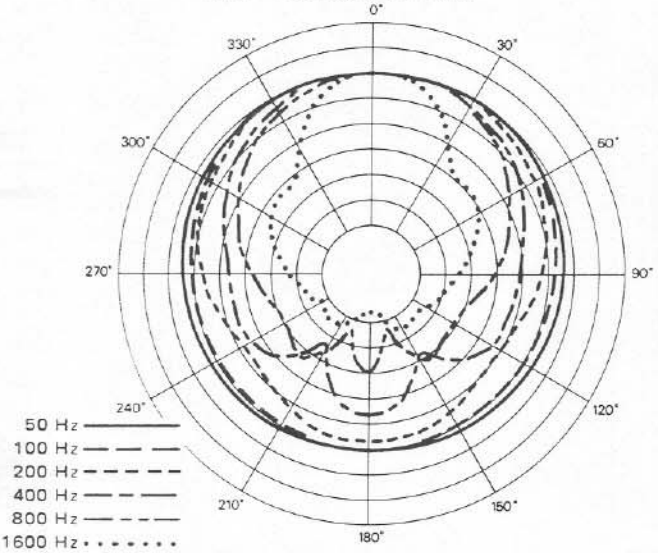


FIGURE 4 – TL505, DL18W Polar Response

4 V RMS of Octave-Band-Limited Pink Noise in Anechoic Environment, 10 Ft on Axis in Horizontal Plane (5 dB per division)

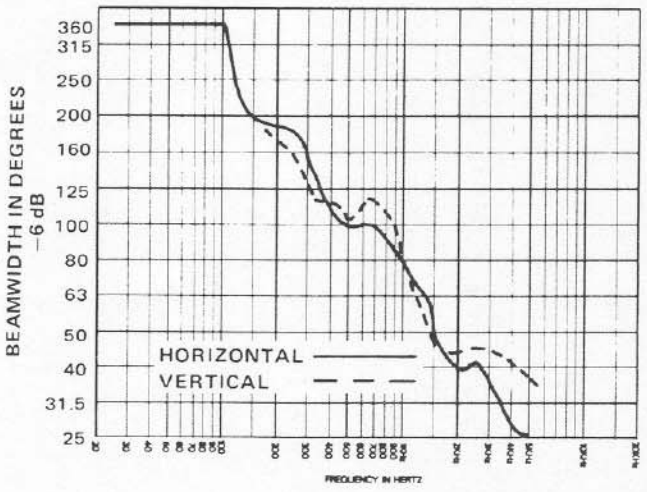


FIGURE 5

TL505, DL18W Beamwidth vs. Frequency

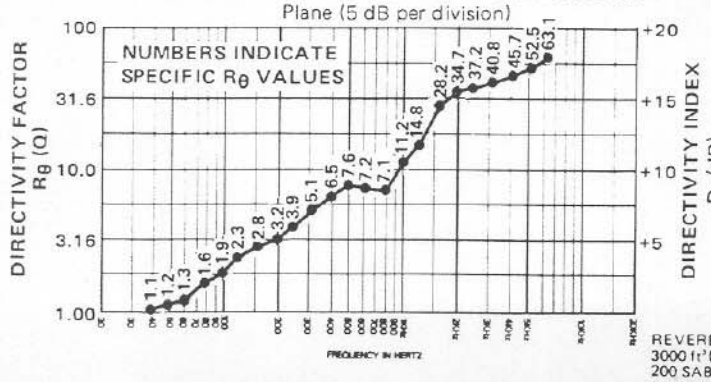
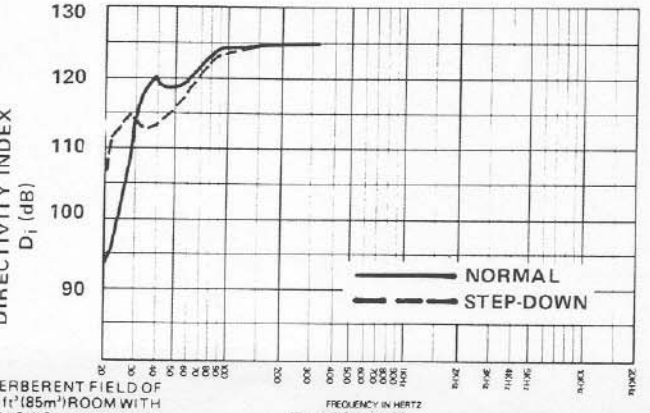


FIGURE 6 – TL505, DL18W Directivity Factor and Directivity Index vs. Frequency



REVERBERENT FIELD OF 3000 ft^3(85m^3) ROOM WITH 200 SABINS ABSORPTION (ROOM CONSTANT = 200)

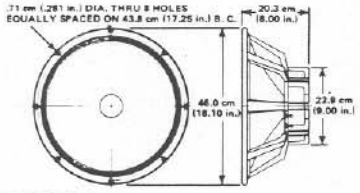
FIGURE 7

TL505, DL18W Theoretical Low Frequency Maximum Acoustic Output vs. Frequency

AES SPECIFICATIONS

The following specifications are in accordance with the "AES Draft Recommended Practice for Specification of Loudspeaker Components used in Professional Sound Reinforcement System – 1983."

Dimension and Weight,

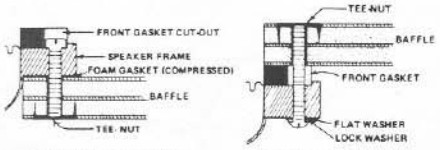


Net Weight:
9.5 kg (21lb)

Shipping Weight:
12.3 kg (27 lb)

Mounting:

The DL18W may be front- or rear-mounted against either surface of its mounting flange and requires a 422 mm (16.6 in.) diameter cutout and a 438 mm (17.25 in.) bolt circle. Normal fasteners up to 6 mm (1/4 in.) will fit through the eight holes in the frame. Front mounting is simplest using the optional SMH-1 speaker mounting kit.



FRONT MOUNT REAR MOUNT

Electrical Connectors:

The DL18W is fitted with a pair of chrome-plated frame-mounted connectors with color-coded ends. Electrical connection is made by pushing down, inserting wire completely through the rectangular slot and releasing pressure. One conductor of #9 AWG stranded, #8 AWG solid, a pair of twisted #15 AWG stranded or a pair of #14 AWG solid conductors will fit. A positive electrical signal applied to the red (+) terminal will displace the cone away from the magnet, thus producing a positive acoustic pressure.

Additional Descriptive Information

Voice-Coil Material:
Copper

Voice-Coil Insulation:
Polyimide, 220 degree C rating

Coil Form:
Polyimide

Magnet Frame:
Cast aluminum

Paint:
Texture epoxy, grey frame, dark red magnet thermal cover

Magnet Plating:
Zinc

Physical Constants,

Effective Piston Diameter:
38 cm (15 in.)

Total Moving Mass:
0.131 kg (4.6 oz)

Voice-Coil-Winding Depth:
20.3 mm (0.8 in.)

Voice-Coil-Winding Length:
26.9 m (88.4 ft)

Top Plate Thickness at Voice Coil:
10.9 mm (0.43 in.)

Z_{min}:
8 ohms

BL Factor:
24.5 tesla meter

Thiele-Small Parameters:

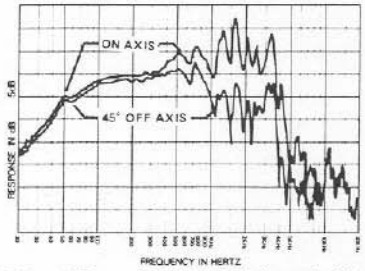
f_s: 25 Hz
Q_{ts}: 0.27
η_o: 2.9%
V_{as}:0.54 m^3 (19.2 ft^3)
R_e: 6.0 ohms
S_d: 0.114 m^2 (177 $in.^2$)

Large-Signal Parameters:

P_e (max): 400 watts
X_{max}: 5.6 mm (0.22 in.)

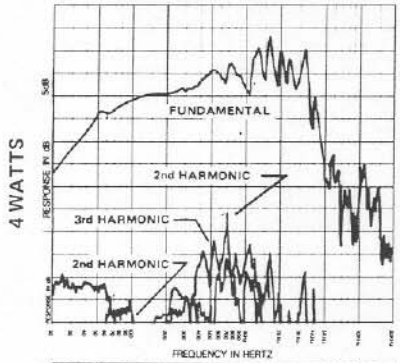
Note: X_{max} is the one-way peak excursion which produces 10% THD of the current waveform when driven at f_s.

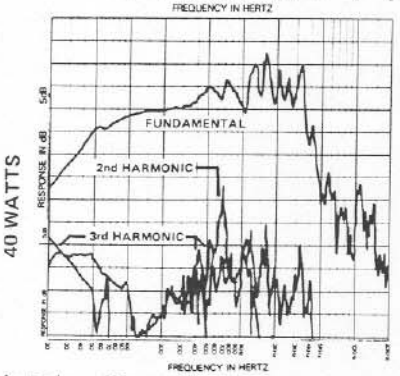
Response in Standard Baffle:



NOTE: AES requires a large, planar baffle for this test, WHICH IS INTENDED TO SHOW SMOOTHNESS AND OFF-AXIS RESPONSE, NOT BASS RESPONSE. This has proven to be inconvenient and prohibitive, due to its size. Here, we have chosen our lab standard low-diffraction 12-cubic-foot test enclosure, which will demonstrate the same characteristics as the "AES standard baffle."

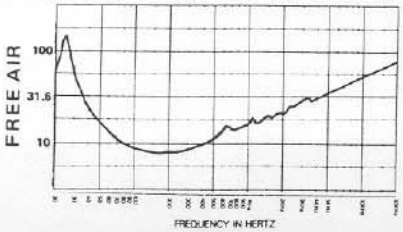
Distortion Response:





Impedance Response:

(see Figures 3A, 3B for box Z curves)



Power Handling (two hours):

400 watts, 50-500 Hz, pink noise, 12-dB/octave filters
500 watts, 100-1000 Hz, pink noise, 12-dB/octave filters

NOTES ON POWER TESTS: The AES recommended two-hour free-air test is a good one and we have assured the user that the DL18W will pass this test under the same conditions. For our own use, however, we subject our sample units to a more demanding test; the eight-hour EIA Standard RS-426A. This test brings out deficiencies which may present themselves after a long term of field use.

Due to the high power rating of the DL18W, we have had to use a pair of (mono) Crown M600 power amplifiers, connected in series or "bridged," so that peak power levels are not clipped. This is not imagined as a normal amplifier compliment for professional use.

Displacement Limit:
12.7 m (.5 in.)

NOTE: Displacement limit is the one-way peak excursion which, when exceeded, will cause physical damage to the drive mechanism

Thermal Rise after Power Test:
82 degrees C (147 degrees F)

Recommended Enclosures:
See text

WARRANTY (Limited) –

Electro-Voice Loudspeakers are guaranteed for five years 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.

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Part Number 530351 – 421

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