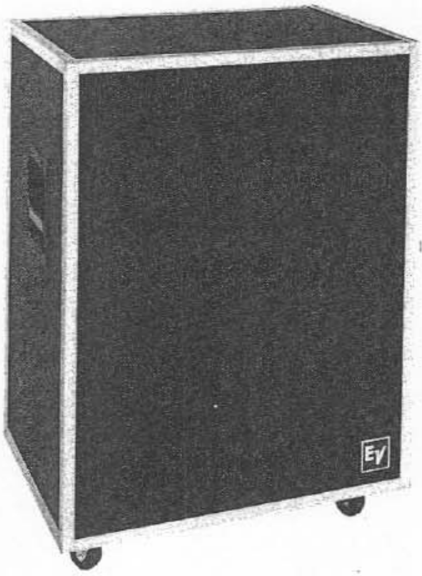


Electro-Voice®

a gulton company

Model LF118 Low-Frequency Speaker System

SPECIFICATIONS

Nominal Frequency Response, Normal Mode, 10 Feet on Axis, Swept One-Third Octave Pink Noise, Half-Space Anechoic Environment (see Figure 2):
40-5000 Hz

Low-Frequency 3-dB-Down Point,
Normal:
40 Hz
Step Down (with equalization):
28 Hz

Half-Space Reference Efficiency:
4%

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

Maximum Midband Acoustic Output Power:
8 watts

Maximum Sound Pressure Level at 4 Feet, Full Power Input, Anechoic Environment, Band-Limited Pink Noise Signal,
100 to 800 Hz:
121 dB
40 to 125 Hz:
118 dB

Sound Pressure Level at 10 Feet, 1 Watt Input, Anechoic Environment, Band-Limited Pink Noise Signal,
100 to 800 Hz:
90 dB
40 to 125 Hz:
87 dB

In-Room Reverberant Field Sound Pressure Levels Below 125 Hz, Relative to Anechoic Environment Measurements,
Floor Location:
+3 dB
Floor/Wall Junction Location:
+6 dB
Corner Location:
+9 dB

Recommended Crossover Frequencies,
As Sub-Woofer:
125 Hz and below
As Full-Range Woofer:
800 Hz maximum (beamwidth limited)

6-dB-Down Beamwidth for Possible Crossover Frequencies, Indicated Bands of 1/3-Octave Pink Noise, Enclosure Long Axis Vertical,
500 Hz Horizontal:
97°
800 Hz Horizontal:
76°
500 Hz Vertical:
123°
800 Hz Vertical:
82°

Box Tuning Frequency,
Normal:
40 Hz
Step Down:
28 Hz

Driver,
Type:
EVM18B Series II
Diameter:
18 inches

Impedance,
Nominal:
8 ohms
Minimum:
7.2 ohms

Input Connections:
Two parallel 1/4" phone jacks

Enclosure Materials:
Black vinyl-clad 3/4" plywood with aluminum trim

Enclosure Equipment:
Casters, carrying handles, and protective steel speaker grille

Box Physical Characteristics,
Gross Internal Volume:
8 cubic feet
Dimensions (see Figure 1):
90.2 cm (35.5") high
71.1 cm (28.0") wide
49.2 cm (19.4") deep

Net Weight:
43.5 kg (96 lb)

Shipping Weight:
45.4 kg (100 lb)

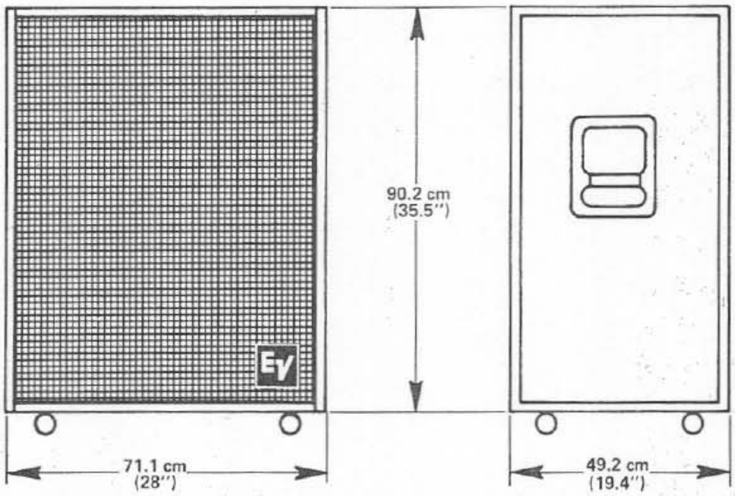


FIGURE 1 — LF118 Dimensions

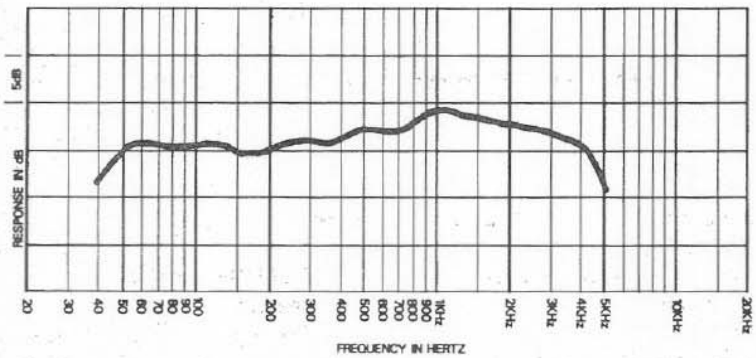
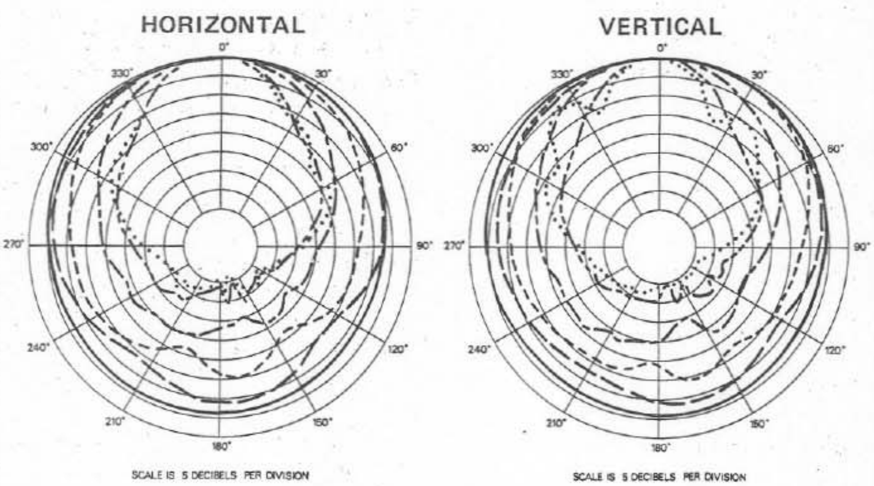


FIGURE 2— LF118 Frequency Response
(Normal Mode, 10 Feet on Axis, Swept 1/3-Octave Pink Noise, Half-Space Anechoic Environment)



125 Hz ———— 1000 Hz — - — -
250 Hz — — — 2000 Hz — - - —
500 Hz - - - - - - 4000 Hz ....

FIGURE 3 — LF118 Polar Response
(Octave Bands of Pink Noise, System Long Axis Vertical, 10 Foot Microphone Distance, Anechoic Environment)

DESCRIPTION & APPLICATIONS

The Electro-Voice LF118 is a sub-woofer speaker system for both permanent and portable sound systems. The LF118 is designed primarily for use below 125 Hz when high acoustic output and extended low-frequency response are required. In conjunction with an appropriate crossover and protective high-pass filter (such as the Electro-Voice XEQ-1A), the LF118 complements the Electro-Voice HF12-3 high-frequency module. This combination provides an unusually flexible high-output, high-accuracy speaker system that is ideal for playback of recorded music in the contemporary dance environment. The LF118 may also be used singly or in multiples in other sub-woofer applications and can serve as the primary low-frequency reproducer in sound reinforcement and recorded music playback systems with crossover frequencies up to 800 Hz.

The LF118 features an EVM18B 18-inch speaker in an optimally vented eight-cubic-foot enclosure. The EVM18B woofer is both highly efficient (90 dB with one watt in at 10 feet) and capable of sustaining very high power inputs (200 watts long-term average per EIA Standard RS-426). Also, the large cone area and optimally vented enclosure contribute to low harmonic distortion and a substantially reduced possibility of "cone bottoming." This is so because the vent actually produces the lowest octave or so of system output, driven to full output by a relatively small motion of the woofer itself. The vent, speaker, and enclosure combine to provide extended, peak-free low-frequency response for a "tight," high-impact sound that less sophisticated designs cannot match.

In the normal mode, LF118 low-frequency response is essentially flat to 40 Hz (3 dB down). This bandwidth is precisely that required for optimum low-frequency reproduction of dance music. When a subharmonic synthesizer is employed to extend the low-frequency content of normal program material, the LF118 may be "stepped down" to extend response to 28 Hz.

The LF118 is packaged for both permanent and portable installations. Enclosure construction is black-vinyl-covered 3/4" plywood with a metal mesh grille that protects the woofer cone. All edges and corners are protected with rugged and attractive aluminum trim. Integral handles and heavy duty casters make setup and transportation easy.

Refer to the following sections of this engineering data sheet for more detailed comment on LF118 performance and application.

[redacted]

LF118 SPECIAL APPLICATION NOTES

This engineering data sheet contains complete specifications and performance characteristics for the LF118. However, the most effective use of the LF118 as a sub-woofer depends on proper design into the total sound system and its physical environment. Separate LF118 Special Application Notes have been prepared, covering the following specific topics:

1. Powering the LF118.
2. Crossover and Typical System Configurations and Adjustments.
3. Placement.
4. Use in Multiples.
5. The Number of LF118's Required

A copy of LF118 Special Application Notes may be obtained from the Advertising Department, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Mich., 49107.

FREQUENCY RESPONSE

Frequency response was measured in a half-space anechoic (echoless) environment at 10 feet on axis with 4 volts of swept 1/3-octave pink noise. The frequency response curve for the LF118 in normal mode is shown in Figure 2.

DISPERSION

The polar response curves for the LF118 are given in Figure 3. This data was taken in an anechoic environment with 4 volts of octave-band-centered pink noise applied to the speaker terminals. The measuring microphone was at a distance of 10 feet. The polar responses of Figure 3 cover both the horizontal (side-to-side) and vertical (up-and-down) planes, with the LF118's long axis placed vertically. From the polar response curves, the 6-dB-down points were obtained and a beamwidth-versus-frequency plot was made. This information is displayed in Figure 4 and shows the expected decreasing coverage angle (increasing directivity) as frequency is increased. For system design, the information in Figure 4 permits comparing the coverage angle of the LF118 to that of the high-frequency transducers employed in the rest of the system. The polar response curves were also used to develop the directivity factor R_θ (sometimes known as Q). This information is shown in Figure 5. The right-hand scale of Figure 5 shows the directivity index D_i.

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

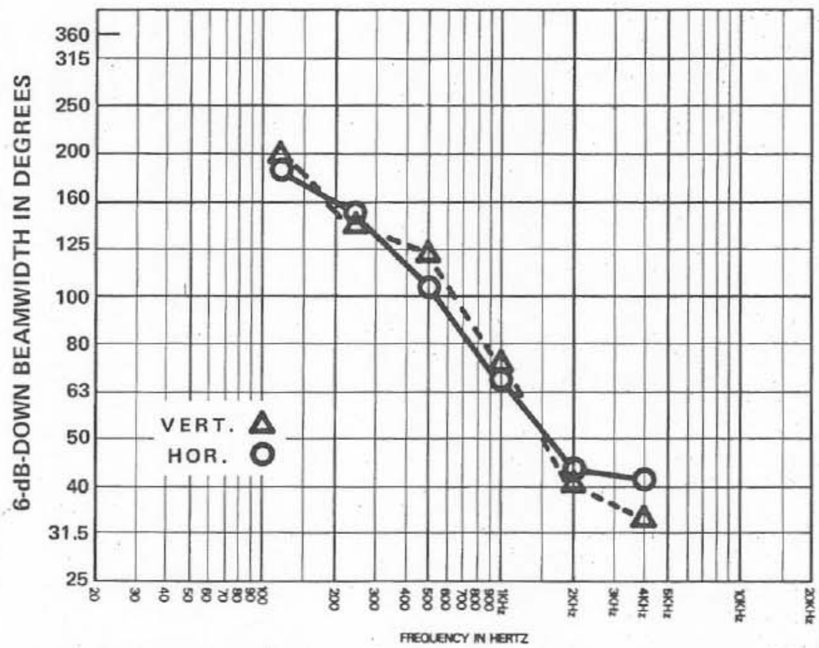


FIGURE 4 – LF118 6-dB-Down Beamwidth versis Frequency
(Octave Bands of Pink Noise, System Long Axis Vertical, 10 Foot Microphone Distance, Anechoic Environment)

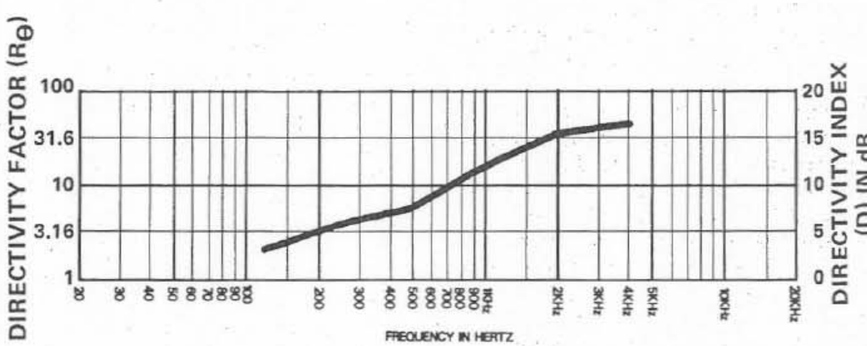


FIGURE 5 – LF118 Directivity Factor and Directivity Index
(Derived from Octave Band Horizontal and Vertical Polar Responses)

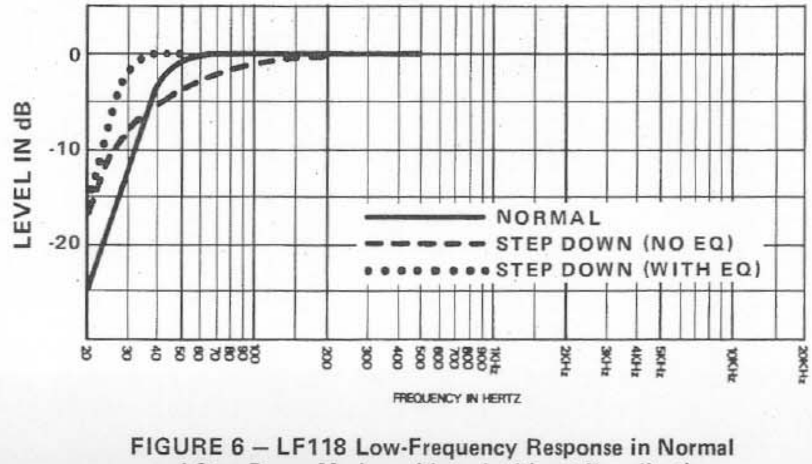


FIGURE 6 – LF118 Low-Frequency Response in Normal and Step-Down Modes, with and without Equalization

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 LF118 is designed to withstand the power test described in EIA Standard RS-426. The EIA test spectrum is applied for eight hours. To obtain this 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 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 200 watts into the 5.6 ohms EIA equivalent impedance (33.5 volts true RMS). Amplifier clipping sets instantaneous peaks at 9 dB above the continuous power, or 1600 watts peak (98.0 volts peak). This procedure provides a rigorous test of both thermal and mechanical failure modes.

ALWAYS USE A HIGH-PASS FILTER

The large power amplifiers that can be used to realize the LF118's full acoustic output ability (see Powering the LF118 section of the LF118 Special Application Notes) must be used with an appropriate high-pass filter in order to avoid speaker damage. Frequencies below the low-frequency 3-dB-down points (40 Hz in the normal mode; 28 Hz in step-down mode) can cause excessive cone excursion which not only "muddies" (modulates) the bass frequencies which the LF118 is designed to reproduce but also can damage the woofer mechanically. The possibility of such sub-pass-band damage and distortion is particularly high in the case of disc playback, where record surface irregularities can produce strong signals in the sub-sonic frequency range (5-25 Hz). It is not recommended that the LF118 (or any other direct-radiator sub-woofer) be used in high-output disc playback systems without appropriate sub-sonic protection. Other potentially damaging very-low-frequency signals can result from "accidents" such as dropping a microphone or phonograph cartridge.

Some phono preamplifiers and equalizers provide sub-sonic protection. The Electro-Voice XEQ-1A active, low-level crossover/equalizer provides protection tailored exactly to LF118 requirements. In the "flat" low-frequency equalization switch position, response is 3 dB down at 30 Hz with a 12-dB-per-octave slope below that frequency. With the switch set for the appropriate step-down equalization, proper bass rolloff is provided below the 32-Hz peak boost frequency.

STEP-DOWN MODE

In the normal mode, the LF118 has a low-frequency 3-dB-down point (f_3) of 40 Hz. This low-frequency bandwidth is optimum for recorded dance music and most sound reinforcement applications. When a sub-harmonic synthesizer is employed to extend the low-frequency content of recorded material, or for other recorded and sound reinforcement applications that require extremely extended low-frequency response, the LF118 may be "stepped down" to provide an f_3 of 28 Hz. This procedure involves lowering the enclosure's resonant frequency from 40 to 28 Hz, and applying appropriate low-frequency equalization. The enclosure de-tuning reduces output somewhat above 40 Hz but increases output below that frequency. This response is appropriate for the equalization required to provide the f_3 of 28 Hz. The required equalization is provided by an underdamped second-order high-pass filter tuned to 32 Hz, with a 6-dB boost at the tuning frequency and a 12-dB-per-octave slope just below that frequency. Figure 8 shows LF118 low-frequency response in the normal and step-down modes, with and without equalization.

The proper electronic equalization for LF118 step down is provided by the Electro-Voice XEQ-1A electronic crossover/equalizer. Alternatively, the Electro-Voice SEQ equalizer may be employed. The XEQ-1A is a single-channel device; the SEQ is dual channel (stereo). Note that the 1/3-octave (and wider bandwidth) equalizers often employed in professional sound systems cannot produce the relatively sharp boost-and-cut characteristic of the step-down equalization. Such equalizers should only be used in addition to the proper step-down equalization.

To put the LF118 enclosure in step-down mode, simply remove the three screws on the aluminum trim pieces above and below the front baffle board. Lift off the trim pieces and the metal mesh grille material. Packed with the LF118 is a plastic bag containing a port cover, a port cover gasket made of foam rubber, and four Phillips head screws. Attach the foam rubber gasket around the back (brown side) outer circumference of the port cover, being careful not to block the screw holes. Place the port cover over the port with the four matching screw holes and secure with the four screws provided. After reinstalling the grille cloth, the aluminum trim pieces may be difficult to install. In this case, loosen the side trim to facilitate re-assembly.

WARRANTY (Limited) —

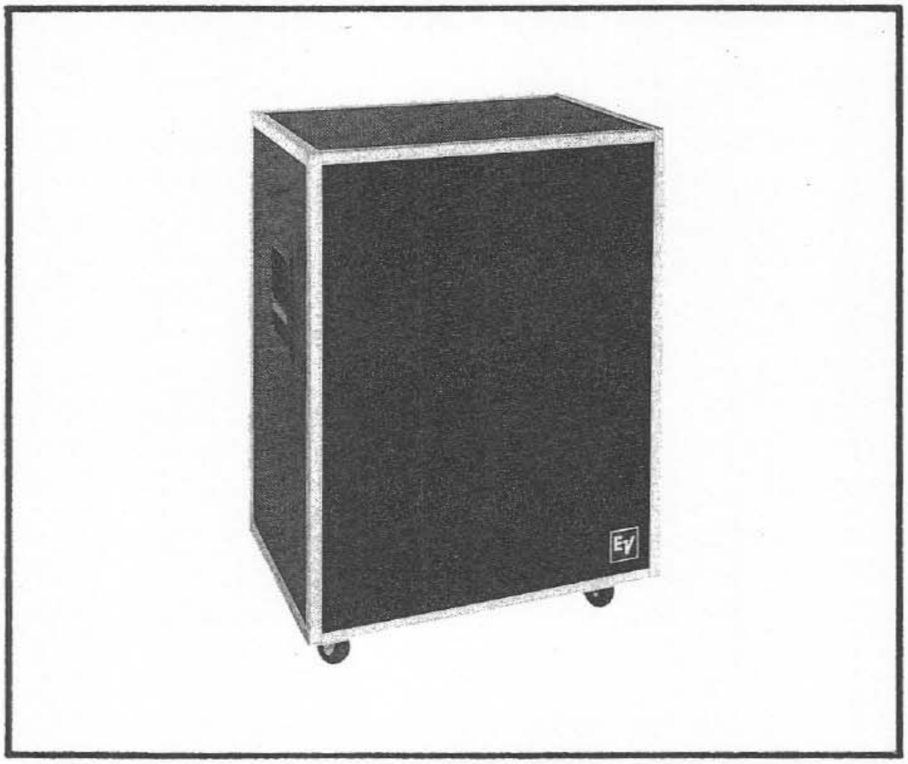
Electro-Voice Professional Sound Reinforcement Loudspeakers and Accessories are guaranteed for five years from date of original purchase against malfunction due to defects in workmanship and materials. If such malfunction occurs, unit will be repaired or replaced (at our option) without charge for materials or labor if delivered prepaid to the proper Electro-Voice service facility. Unit will be returned prepaid. Warranty does not cover finish or appearance items or 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 shipping address and instructions on return of Electro-Voice products for repair and locations of authorized service agencies, please write: Service Department, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107 (Phone 616/695-6831) or Electro-Voice West, 8234 Doe Avenue, Visalia, CA 93277 (209/625-1330,-1)

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

Service and repair address for this product: Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

Specifications subject to change without notice.



Electro-Voice®
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Model LF118 Low-Frequency Speaker System

SPECIAL APPLICATION NOTES

Complete specifications and performance characteristics of the LF118 are contained in a separate engineering data sheet. These special application notes cover a variety of application and installation considerations.

POWERING THE LF118

The following comments will help you choose an amplifier of appropriate rated power output (average sine wave or so-called "RMS" watts) for the LF118.

For Sound Reinforcement and Recorded Music Playback

To take full advantage of the acoustic output ability of the LF118, an amplifier larger than the 200-watt long-term average rating may be used. An amplifier with two-to-four times the long-term average rating is recommended in this context (400 to 800 watts). Such amplifiers will permit driving the LF118 to near its 200-watt long-term average rating (and near to its maximum long-term sound pressure level of 121 dB at 4 feet) with enough additional power to handle the short-duration peaks that exist in typical program material but do not harm the speaker. An 800-watt amplifier, for example, would allow peaks of 6 dB above a 121-dB long-term average and peaks of 10 dB above a 117-dB average.

The caution cannot be made strongly enough, however, that this recommendation is only for knowledgeable system operators who can discipline themselves against "pushing" the system for ever-higher sound levels and who can avoid the "accidents" which can almost instantly overpower a speaker system. (Typical accidents are catastrophic feedback and dropping a microphone on the floor or phonograph cartridge on the record.) An amplifier in the 400-to-800-watt range allows short-duration peaks of 3-to-6 dB above the 200-watt long-term average rating of the LF118. However, if the level is pushed so that the amplifier starts clipping a substantial portion of the program peaks (as evidenced by a harsh sounding, irritable distortion), the long-term average power capacity of the speaker may be exceeded.

If a more conservative approach seems appropriate, an amplifier about equal to the LF118's long-term average power rating of 200 watts, say 150 to 250 watts, is recommended. For example, a 200-watt amplifier, assuming peaks of 6-to-10 dB above the long-term average program level, would produce long-term average sound levels in the 111-to-115 dB range at 4 feet.

Warning: particularly in the case of disc playback systems, it is assumed that an appropriate high-pass filter is employed to remove sub-pass-band information below the LF118's low-frequency 3-dB-down points (see ***Always Use a High-Pass Filter*** section of the LF118 engineering data sheet).

For Musical Instrument Applications

Special consideration should be given to amplifier power if the LF118 is used in musical instrument applications such as bass guitar or organ. Amplifier clipping is sometimes part of the desired "sound," so that the peaks of such program may not be very far above the long-term average. Thus, if amplifiers ranging from 400 to 800 watts are used with the 200-watt LF118, it will be more likely to exceed the LF118's long-term average power rating than if the program material were undistorted voice or miked instruments. The importance of this consideration is heavily influenced by the particular playing style.

CROSSOVER AND TYPICAL SYSTEM CONFIGURATIONS AND ADJUSTMENTS

Crossover Frequency

When the LF118 is used as a sub-woofer, a crossover frequency of 125 Hz or lower is recommended. Higher frequencies may be used without damage, but at higher frequencies more program material will be fed to the LF118, creating a discontinuity in source localization between the low- and high-frequency speaker systems that may not be desirable. The specific application will very much influence the subjective effect of crossover frequencies above 125 Hz.

If the LF118 is used as a primary woofer in a two- or three-way system, crossover frequencies up to about 800 Hz are appropriate. Higher frequencies may be used but dispersion above 800 Hz is narrower than that of many of the horns to which the LF118 might be matched. For the most precise system design, the 1/3-octave pink noise coverage angles may be considered. For example, a 500-Hz crossover provides a good match to horns with horizontal coverage angles in the range of 90 to 120 degrees (with the LF118's long axis vertical, the 500-Hz 1/3-octave 6-dB-down horizontal coverage angle is 97°). An 800-Hz crossover provides a good match for a 60-degree horizontal coverage angle (with the LF118's long axis vertical, the 800-Hz 1/3-octave 6-dB-down horizontal coverage angle is 76°). Additional coverage angle information is given in the ***Specifications*** section of the engineering data sheet.

Crossover and Bi-Amplification with HF12-3 High-Frequency Modules

The Electro-Voice XEQ-1A electronic crossover/equalizer is ideal for bi-amplification of the LF118 sub-woofer and HF12-3 high-frequency modules. The XEQ-1A's crossover frequency is determined by plug-in modules. For the recommended 125-Hz crossover frequency, order the optional 125-B3 module. One XEQ-1A will be required for each program channel (i. e., two XEQ-1A's are required for the typical stereo installation). Figure 1 shows a typical installation using two HF12-3's, powered by a stereo power amplifier, and a single LF118 powered by a monaural power amplifier (or mono-bridged stereo amplifier). The single LF118 amplifier channel is driven from the common-bass output connections of the XEQ-1A's. Details of the common-bass hookup are given in the XEQ-1A engineering data sheet.

Two LF118's may be used in a hookup similar to that shown in Figure 1. Follow the interconnection instructions given in the ***Use in Multiples*** section. An LF118 pair may also be driven from a stereo power amplifier without using the common-bass output configuration of the XEQ-1A's. This connection is shown in Figure 2.

Relative Level and Phase Adjustments When Using HF12-3's and the XEQ-1A Crossover

In the bi-amplified systems described above (and shown in Figures 1 and 2), the sub-woofer level may be adjusted by ear to provide the appropriate "support" for the HF12-3 high-frequency modules. When power amplifiers of equal input sensitivity are employed, a good place to start is with all amplifier level controls set identically and the high-frequency level control on the XEQ-1A crossover at maximum (full clockwise). Adjustment for taste and the particular sub-woofer location(s) can then be made while auditioning typical program material at a normal operating sound pressure level. When acoustic measuring equipment is available (such as a real-time spectrum analyzer and a companion pink noise generator and test microphone), most high-performance dance music systems are adjusted for flat or slightly rising bass response on the dance floor. Sometimes, additional adjustable equalization is made available to the disc jockey to tailor the effect of specific program material.

Response in the 125-Hz crossover range can be affected by the relative phase between the low- and high-frequency speaker systems. The phase reversal switches on the XEQ-1A should be set to provide the most pleasing sound quality. If no difference is audible, simply be certain that both switches in a stereo system are identically set. Alternatively, the relative phase between low- and high-frequency speakers can be set for flattest response in the crossover range, using a real-time spectrum analyzer. For either procedure, the best relative phase is a function of the specific locations of listeners, sub-woofer(s), and high-frequency modules, so no hard-and-fast rule is possible.

PLACEMENT

Placement of the LF118 is no more critical than for other woofer or sub-woofer assemblies. However, for the limited-bandwidth sub-woofer application for which the LF118 is primarily designed, some specific comments will be helpful.

General Guideline for the Dance Environment

For maximum impact in dance music applications, it is recommended that the LF118 be placed at floor level, in close proximity to the dance floor.

Placement for Maximum Sound Pressure Level

The following information applies to frequencies below about 125 Hz, where the LF118 behaves essentially as an omnidirectional radiator. For a given input power, placement of the LF118 in the center of a large floor will increase the sound pressure level in typical listening positions by about 3 dB relative to the level noted in the ***Specifications*** section of the engineering data sheet. (The levels in the Specifications section were measured in an anechoic environment where there are no acoustically reflective surfaces.) Placement at the intersection of two perpendicular surfaces (such as at a floor-wall juncture) will provide an additional 3-dB increase. Placement in a room corner will produce yet another 3 dB. These sound pressure level increases are substantial (it requires four times the amplifier power to achieve a 6-dB change), so it is recommended that walls and corners be taken advantage of where physical conditions permit. For maximum effectiveness, the walls must be rigid. Concrete or block construction is usually best but conventional interior wall construction employing dry wall and wooden vertical members can also be satisfactory.

Consideration of Standing Waves

If architectural considerations permit, experimentation with the location of the LF118 beyond the general guidelines just indicated may reveal some specific placements that yield the best audible bass performance. This is so because the performance of very-low-frequency speakers is heavily influenced by a room's particular standing wave patterns. The frequency of these supportive waves is determined by room dimensions (length, width, and height). In the simplest case, standing waves will occur between any two parallel room surfaces. Standing waves will also be set up by more complex geometric situations, involving even non-parallel surfaces and more than two room boundaries. Returning to the simplest case, as an example, the first standing wave set up by two surfaces 20 feet apart would be at 28 Hz. The sound level would be strongest at the two room boundaries. A "null" of almost no sound level would occur at a point midway between the two boundaries. The room boundaries would also produce standing waves at multiples of the first frequency (57 Hz, 85 Hz, 113 Hz, etc.). The number of sound level maxima and minima increases as the frequency increases. For example, the 57 Hz mode would have two nulls, with level maxima not only at the two room boundaries but also at the room midpoint.

Some room dimension combinations provide a group of standing waves which are spread evenly over the low-frequency range. This is desirable. Other combinations produce an uneven distribution which makes it harder to achieve satisfactorily uniform bass performance. (Above a few hundred Hertz, the standing wave modes are so close to one another in frequency that they blend together in a smooth average.) Regardless of a room's particular standing wave distribution, the excitation of the standing waves is influenced by the LF118's position. The LF118 must be in the position where the standing wave would be at a level maximum in order to fully excite the mode. All possible standing waves are excited if the speaker is in a room corner. However, some of the standing waves will not be excited- -or excited to a reduced degree- -for other speaker positions. Also, even if a standing wave is excited, a particular listening location may show a relatively low sound level because the observer is in or near the null of the standing wave.

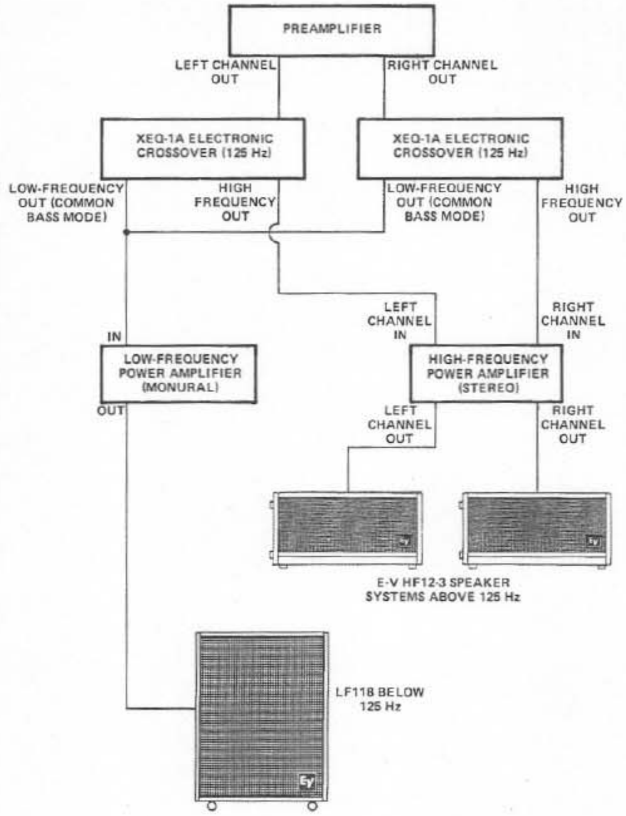

FIGURE 1 – Typical Stereo System Using a Single LF118 in the Common Bass Mode

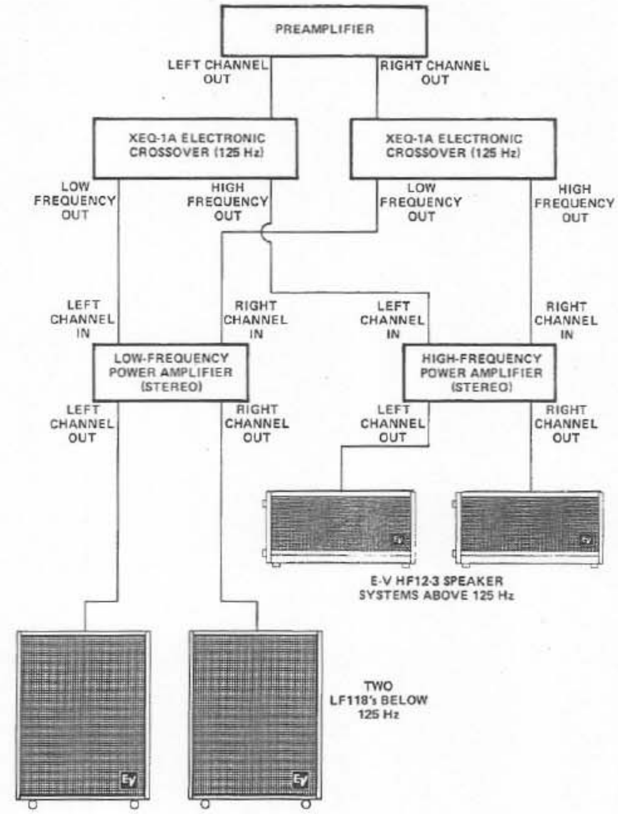

FIGURE 2 – Typical Stereo System Using Two LF118's with Separate Channels of Low-Frequency Amplification

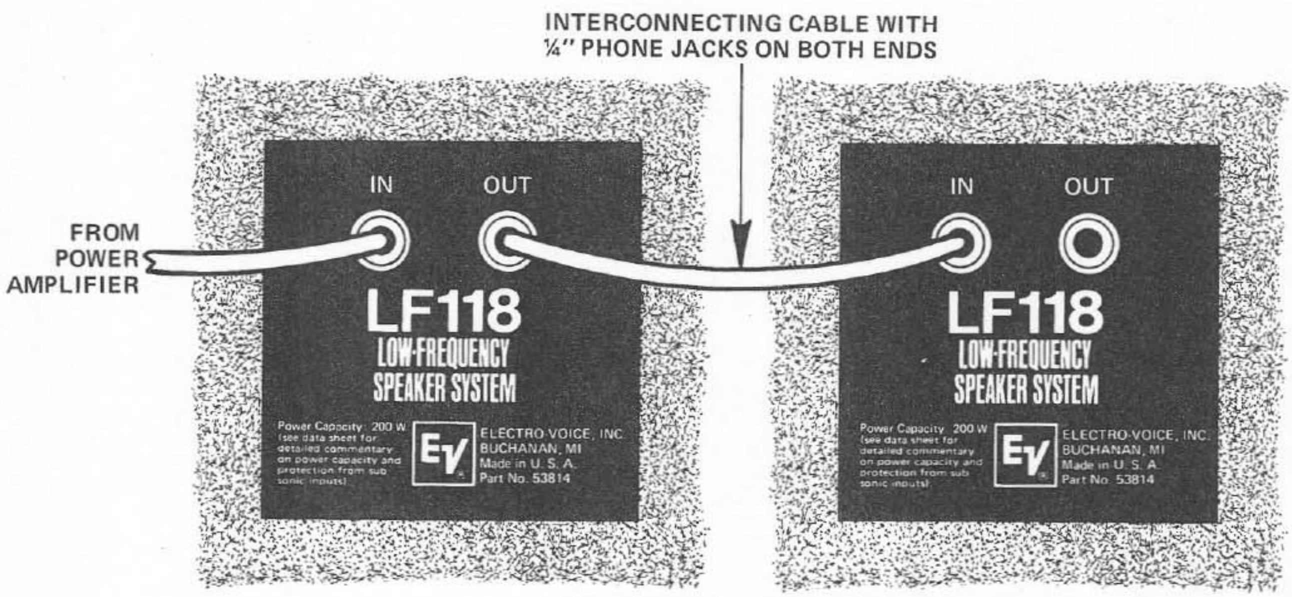

FIGURE 3 – Two LF118's in Parallel Connection
(Combined Impedance 4 Ohms)

USE IN MULTIPLES

LF118's may be used in multiples to increase acoustic output (also see The *Number of LF118's Required* section). In the following discussion, it is assumed that all speaker cones are operating in unison (in phase) when a common signal is applied. This condition will be met if the inter-connection instructions at the end of this section are followed.

A maximum increase of 6 dB results when two LF118's are located side-by-side. For operation at very low frequencies, the woofer cones effectively couple, acting as one speaker with a cone area twice that of a single 18-inch speaker. (For the LF118, effective coupling occurs below about 120 Hz, where wavelengths are such that the center-to-center distance between the two EVM18B's is less than one-quarter wavelength.) This coupling doubles efficiency, providing a 3-dB increase in sound pressure level with constant power applied. The second 3-dB increase results from the doubling of total power capacity. The additional power can be provided by a separate second power amplifier driving the second LF118. However, note that many solid state power amplifiers deliver about twice the power when the load impedance is halved, as is the case when two LF118's are connected in parallel. Widely spaced double LF118's will tend to be limited to the 3-dB power handling increase.

If side-by-side operation of two LF118's is not convenient, essentially the same performance will result if the front baffles are placed at 90 degrees to one another, such as in a room corner. The LF118's may also be stacked vertically.

More than two LF118's may be used for increased output. For example, four closely coupled LF118's would provide a 12-dB increase in maximum acoustic output relative to a single system. (This is equivalent to increasing amplifier power 16 times.) A "two-by-two" array (two LF118's wide and two high) results in maximum coupling. Four LF118's may also be placed side-by-side, but the 12-dB increase in output ability will be somewhat reduced since the two end systems are not closely coupled.

The dual parallel 1/4" phone jacks (labeled In and Out) at the rear of the LF118 facilitate the parallel connection of multiple LF118's. There are two precautions, however. First, be certain to employ interconnecting cables that maintain proper relative phase between any two LF118's. For example, if the coded lead is connected to the tip of the 1/4" phone jack at one end of a cable, the same connection should be made at the other end of the cable. Second, the impedance changes that result from parallel connection must be kept in mind. A single LF118 has a nominal 8-ohm impedance. When two units are connected in parallel by using the paralleled input jacks and an appropriate interconnecting cable, the impedance drops to 4 ohms. Figure 3 shows such a parallel connection. More than two LF118's may be paralleled. However, the combined impedances will continue to drop. Three LF118's in parallel provide a load of 2.7 ohms; four provide a load of 2 ohms. Many power amplifiers will not drive loads under 4 ohms, so consult the appropriate owner's information.

THE NUMBER OF LF118's REQUIRED

The number of LF118's required to balance other system components is a general question that depends on the efficiency and maximum output ability of associated components, as well as on the nature of the program material. Therefore, specific recommendations are not possible without knowledge of the complete sound system. Reference to the detailed Specifications section of the LF118 engineering data sheet will be helpful in this general case.

When Used with Electro-Voice HF12-3 High-Frequency Module

When the LF118 and HF12-3 modules are used in a system for playback of recorded dance music, the following specific recommendations can be made. In most situations, a single LF118 crossed over at about 125 Hz will properly match a stereo pair of HF12-3's. However, two LF118's per stereo pair are recommended under the following conditions:

1. Use two LF118's when unusually high bass output level is required, such as would be the case if a great deal of low-frequency equalization (boost) is employed, perhaps in conjunction with a sub-harmonic synthesizer.

2. Use two LF118's if unfavorable room acoustics and/or speaker location result in insufficient bass output relative to the output of the high-frequency modules.

3. Use two LF118's when they are modified for the step-down mode. The additional bass response (from 40 Hz to 28 Hz) is not responsible for this recommendation. However, the lower enclosure tuning frequency in the step-down mode (28 Hz instead of 40 Hz) increases woofer excursion in the frequency range where much dance music bass occurs (50 to 80 Hz). Therefore, two stepped-down LF118's are required to retain the same maximum output ability in this frequency range as one LF118 would provide in the normal mode.