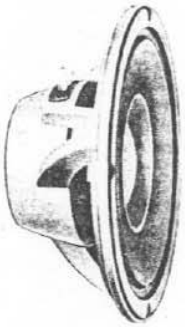
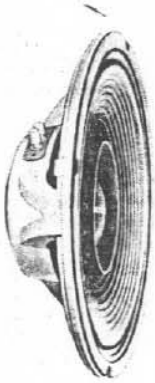
WOLVERINE

by Electro-Voice

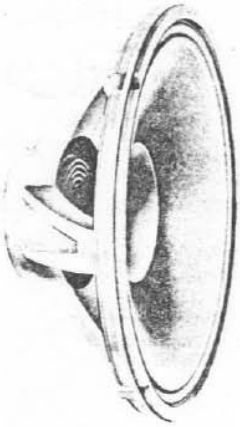
OBSOLETE



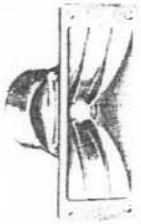
Model LS8



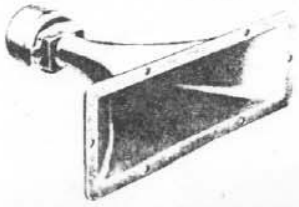
Model LS12



Model LS15



Model HF1



Model MF1

Wolverine loudspeakers and components are designed to produce the finest high-fidelity sound possible. To obtain the maximum performance inherent in your new Wolverine equipment, read these instructions thoroughly before you begin installation.

Each Wolverine product is carefully tested and inspected before leaving the factory; an individual frequency response curve check is run on each speaker, driver and crossover. These curves must precisely match the performance of the Laboratory standard. Your Wolverine equipment installed properly and operated in accordance with the instructions given in this booklet will give you years of listening satisfaction.

GENERAL DESCRIPTION — The Wolverine LS8, LS12, and LS15 loudspeakers are designed to operate effectively both as full-range speakers and as woofers in multiway systems. When used as full-range units, they provide optimum sound reproduction at a minimum cost.

Wolverine Step-Up Kits provide a simple method for increasing performance of your loudspeaker system in stride with the budget, by building from a single loudspeaker to a deluxe 3-way system with properly matched components, and without obsoleting existing components.

The Model HF1 High-Frequency Step-Up Kit should be the first addition to an LS8, LS12 or LS15 loudspeaker. This step-up kit will give greater efficiency from 3500 cps to beyond the limits of audibility, plus greater dispersion of the high frequencies in the listening area for good stereo. The result is silky, precise definition of all string and woodwind instruments, together with an even spread of sound, giving "front row" performance throughout the room. The HF1 package consists of a matched VHF driver (Model TW35) and crossover network (Model CR35) with built-in level control.

The final addition, recommended for the LS12 or LS15 loudspeaker as the basic unit, is the MF1 Mid-Frenquency Step-Up Kit. This allows the LS12 or LS15 speaker to operate solely as a woofer, restricting its response to frequencies below 1000 cps. The mid-range horn utilizes the diffraction principle of high frequency sound dispersion through a solid 120° angle giving best stereo effect. The audio range is thus divided for more efficient reproduction of each frequency section, lowering both harmonic and intermodulation distortion. The MF1 Step-Up Kit increases the output of sound in the vital presence range and gives well defined "voice" response. The MF1 package consists of a matched treble driver (Model MR10) and crossover network (Model CR10) with built-in level control. All wiring is supplied with Wolverine Step-Up Kits for simple 5-minute installation.

THEORY OF OPERATION

THE AVEDON SONOPHASE THROAT DESIGN — Figure No. 1A shows the cross section of a conventional high-frequency driver. Response is flat up to 4 or 5 kc after which destructive interference results from inability of the diaphragm to act as a piston. Increasingly higher frequencies cause the phase of sound produced at the diaphragm periphery to shift with respect to sound produced by the diaphragm center due to diaphragm deformation (Figure No. 1B).

In the Sonophase design, Figure No. 2, sound from the central portion of the diaphragm is delayed by the longer pathlength, restoring proper phase relationship and level as the frequency increases. The importance of the Sonophase configuration is paramount above 12 kc, where sound must be taken from the center of the diaphragm and the outer periphery simultaneously; this is accomplished without destructive interference or cancellation within the sound chamber. At lower frequencies, where the diaphragm is a piston, and no phase shift is required in the path configuration, the longer central path length does not appreciably change the phase due to the longer wavelength involved.

Models LS8, LS12, LS15 / HF1, MF1 Instructions

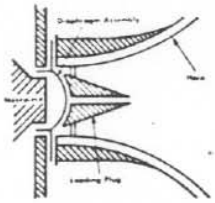
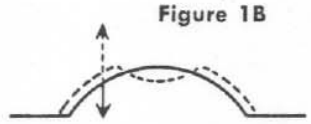


Figure 1A

Figure 1B



Action of diaphragm at higher frequencies. Dotted line shows departure from piston action.

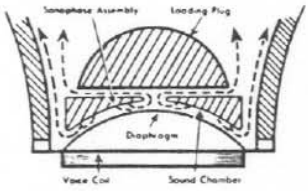


Figure 2

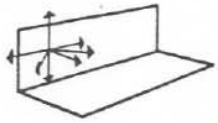


Figure 3A

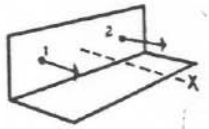


Figure 3B

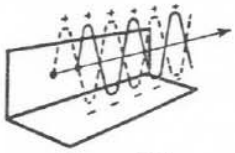


Figure 3C

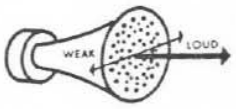


Figure 3D

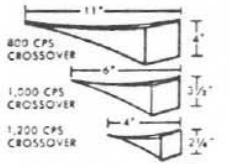


Figure 3E

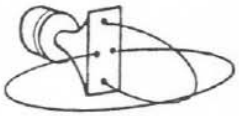


Figure 3F

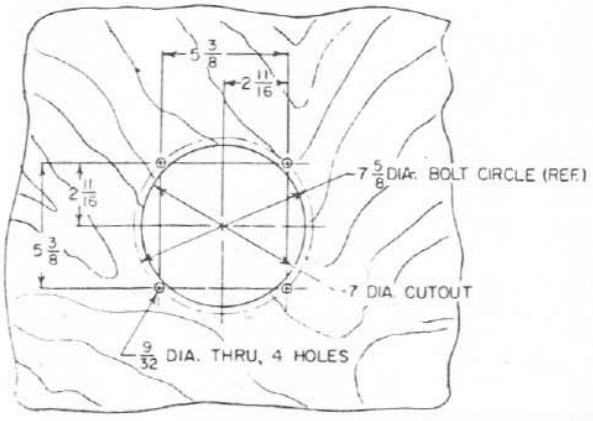


Figure 4 — LS8 Cutout and Mounting Dimensions

THEORY OF OPERATION (Cont.)

THE HOODWIN DIFFRACTION HORN — All Electro-Voice drivers employ diffraction horns as the recommended method of achieving the best dispersion. In stereo work especially, a 3 db concentration of sound in one portion of the room is sufficient to cause apparent displacement of the subject, with resultant distortion of the "solid" or stereo effect. This changes the aural perspective so necessary to the preservation of the illusion of reality, and smooth dispersion insures duplication of the original sound source depth and width. The spatial relationship of the original sound source to the axis of the two ears is termed the aural horopter, and an even sound distribution, coupled with balancing the levels of both right and left speakers is insured through the diffraction principle. The Hoodwin diffraction principle is best illustrated by reference to Figures 3A through F.

Figure 3A shows how sound disperses equally in all directions from a single point source.

In Figure 3B two sound sources are shown. On the axis, at point "x", double the sound power results as the resultant pressures are in phase.

But, as in Figure 3C, if the distance between the two sources is ½ wavelength or greater, the sound from the two sources will be considerably out of phase for points off the axis resulting in decreased sound pressure.

Figure 3D shows the deficiencies in horns of wide lateral dimensions compared to the wavelength being emitted. Any horn mouth can be considered as a group of small point sources of sound. They **must** beam the sound down the axis by their very nature.

In Figure 3E are shown representative horns, illustrating that horns must have a certain length, as well as cross sectional area along this length and at the mouth to load the driver diaphragm down to the lowest frequencies to be reproduced. The lower we go, the longer must be the horn and the greater the mouth area. This physical fact shows that large horn mouths necessarily beam the high frequencies.

Figure 3F shows that narrowing the horizontal area and extending the vertical dimension of the horn mouth preserves the loading area necessary for good low end response, disperses the sound perfectly in the horizontal direction where it is so necessary, and keeps interfering reflections off the floor and ceiling.

Corollary advantages of Hoodwin diffraction are much greater efficiency due to elimination of the viscous resistivity of the air caused by a multiplicity of horn throats, as in cellular horns; elimination of losses due to friction caused by lens assemblies, and the compactness of diffraction horns when contrasted to other media.

VOICE COIL ASSEMBLY — By using a diaphragm assembly of practically indestructible phenolic-impregnated linen, radial splitting, buzzing and modular breakup are eliminated. Because reproduction of the extreme high frequencies is mass-controlled, the self-supporting voice coil has no heavy coil form and is therefore practically weightless, providing extended high-frequency response.

SPECIFICATIONS

	Model LS8 8" Full-Range Loudspeaker	Model LS12 12" Full-Range Loudspeaker	Model LS15 15" Full-Range Loudspeaker
Frequency Response:	50 to 13,000 cps	30 to 13,000 cps	30 to 13,000 cps
EIA Sensitivity Rating:	42 db	43 db	48 db
Free-Space Cone Resonance:	55 cps	40 cps	38 cps
Power Handling Capacity: Program Material: Peak:	20 watts 40 watts	20 watts 40 watts	20 watts 40 watts
Critical Damping Factor:	15	15	15
Impedance:	8 ohms	8 ohms	8 ohms
Mechanical Crossover:	2000 cps	1800 cps	1600 cps
Voice Coil Diameter:	2 inches	2 inches	2 inches
Total Flux:	70,700 maxwells	70,700 maxwells	89,000 maxwells
Dimensions:	8⅜ in. dia. x 3½ in. overall depth	12¼" dia. x 3½" overall depth	15⅛" dia. x 6 11/32" overall depth
Mounting:	4-¼" holes equally spaced on 7⅛" circle	4-⅜" holes equally spaced on 11½" circle	4-9/32" holes equally spaced on 14 9/16" circle
Baffle Opening:	7⅛ inches	11 inches	13 7/8 inches
Power required for level of 100 db (Concert Volume, Average Program Material, Live Room):	15 watts	12 watts	8 watts

SPECIFICATIONS (Cont.)

	Model TW35 High-Frequency Driver	Model MR10 Mid-Frequency Driver
*Frequency Response:	3500 to 18,000 cps	1000 to 15,000 cps
Recommended Crossover:	3500 cps	1000 cps
EIA Sensitivity Rating:	50 db	52 db
Polar Pattern:	180° dispersion	180° dispersion
*Power Handling Capacity:		
Program Material:	50 watts	20 watts
Peak:	100 watts	40 watts
Nominal Impedance:	8 ohms	8 ohms
Voice Coil Diameter:	1 inch	1 inch
Magnet Weight:	2 oz.	6.8 oz.
Total Flux:	65,650 maxwells	129,280 maxwells
Size:		
Horn:	5¼ in. long x 2 in. wide	10½ in. long x 4 in. wide
Pot Diameter	2¼ in. max.	2⅜ in.
Depth:	2¾ in.	9⅜ in.
Baffle Opening:	1¾ in. x 4¼ in.	9½ in. x 3 in.

	Model CR35 Crossover and Level Control	Model CR10 Crossover and Level Control
Crossover Frequency:	3500 cps	1000 cps
Impedance:	8 ohms	8 ohms
Insertion Loss — LO/HI	.75 db/ 0 db	.8 db/0 db
Configuration:	¼ section	¼ section
Attenuation:	6 db/ oct.	6 db/oct.
Phase Rotation:	135°	135°
Dimensions:	3¼ in. high, 2½ in deep, 3 in. wide	3¼ in. high, 2½ in. deep, 3 in. wide

*With recommended crossover.

INSTALLATION

RECOMMENDED — ENCLOSURES — To get the best performance from your new Wolverine components, they should be installed in a Wolverine enclosure. Wolverine speakers and enclosures have been designed as matching units for extended low-frequency response. Two enclosures are available for the LS12 speaker, the Loraine for use in the corner of the room, and the Lancaster for use against a flat wall. The LS12 or LS15 will fit in the Electro-Voice Model KD9 Marquis Kit.

The Lindon enclosure is ideal for bookshelf placement, and will house both the LS8 8" loudspeaker and HF1 high-frequency Step-Up Kit. Both the Loraine and Lancaster enclosures come equipped with an 8" adapter ring, and can optionally accommodate the Model LS8 loudspeaker. These enclosures contain precut ports for the addition of HF1 and MF1 Step-Up Kits.

Instructions for the installation of speakers in Wolverine cabinets accompany the cabinets.

INSTALLATION IN OTHER THAN WOLVERINE CABINETS— If you are not using a Wolverine enclosure to mount your components, you may have to cut mounting holes. Correct dimensions for cutting the mounting holes, and screw holes for the Wolverine LS8, LS12 and LS15 loudspeakers are shown in Figures 4, 5 and 6; for TW35 and MR10, see Figures 7 and 8.

Four No. 12 x 1½" long wood screws can be used to mount the LS8, LS12 and LS15, but these may loosen up in time and the preferable mounting method is to use four 3/16" x 2" long carriage bolts with hex nuts and washers. Tighten the mounting screws or bolts only enough to compress the speaker gasket — too much pressure can warp the speaker frame and cause the voice coil to rub.

When mounting the TW35, four No. 8 x ½" wood screws will hold the driver securely in place. The MR10 mid-range driver may be mounted with four No. 8 x ½" wood screws.

The CR35 and CR10 crossover networks are mounted simply by drilling a ⅜" hole, inserting the threaded level control shaft, and fastening the escutcheon in place with the hardware provided (See Figure 9). Rotate the escutcheon until the knob corresponds with position #1 when completely counter-clockwise; then tighten.

WIRING — All Wolverine speakers are color coded to indicate polarity. A red marking or the code "T1" indicates positive polarity (the cone or diaphragm will move away from the magnet when a positive voltage is applied), and black or "T2" coding indicates negative polarity. Figure 10 shows correct wiring for an LS8, LS12 or LS15 loudspeaker and the HF1 Step-Up Kit. Figure 11 shows the addition of an MF1 Step-Up Kit.

Note that all leads coded black connect to terminals marked "Common." If these wiring diagrams are followed, all speakers will be properly phased. The lead wires to the amplifier should be No. 18 fixture wire (common lamp cord) for lengths up to 20 or 30 feet; for longer lead lengths, use No. 16 2-conductor

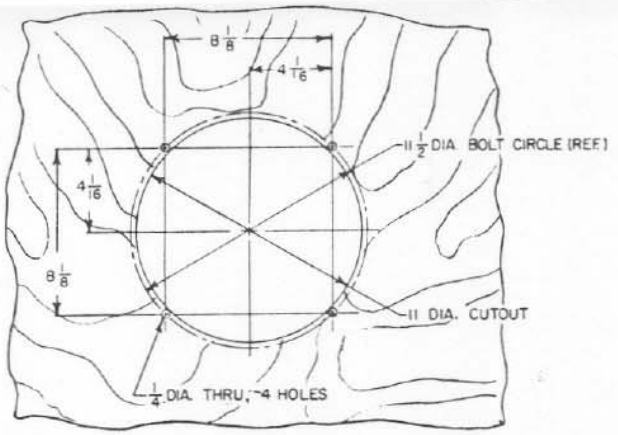


Figure 5 — LS12 Cutout and Mounting Dimensions

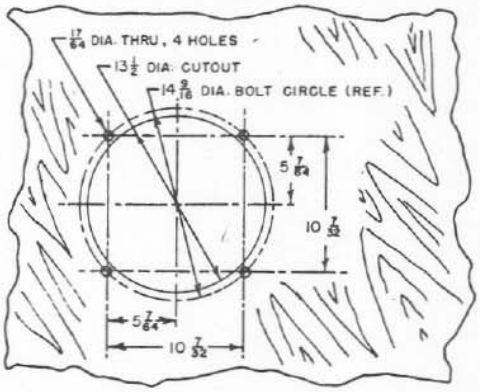


Figure 6 — LS15 Cutout and Mounting Dimensions

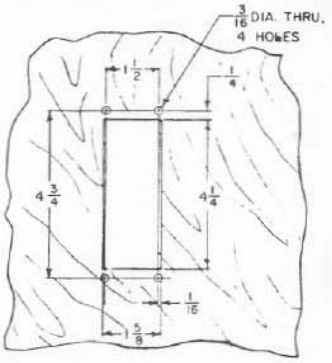


Figure 7 — TW35 Cutout and Mounting Dimensions

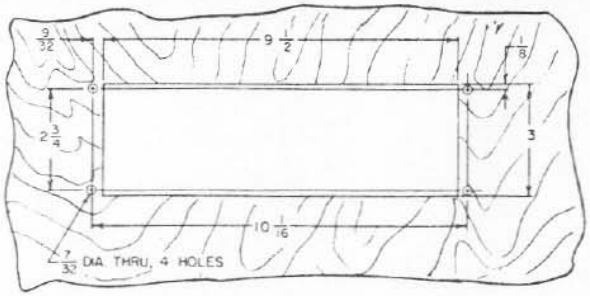


Figure 8 — MR10 Cutout and Mounting Dimensions

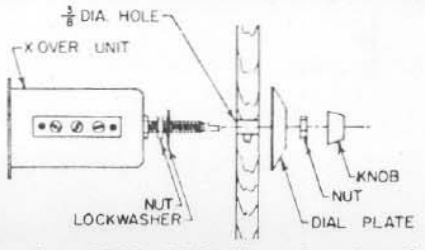


Figure 9 — CR10, CR35 Mounting Details

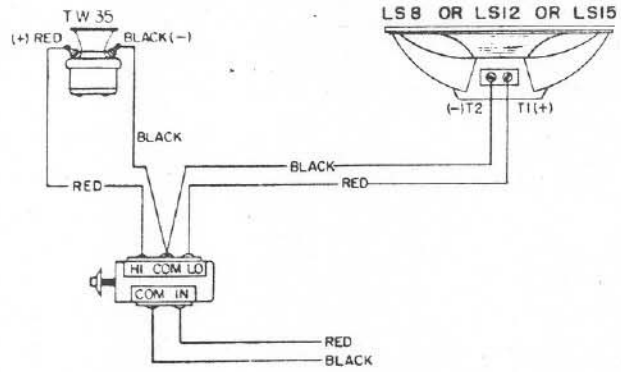


Figure 9 — Wiring Diagram Two-Way System

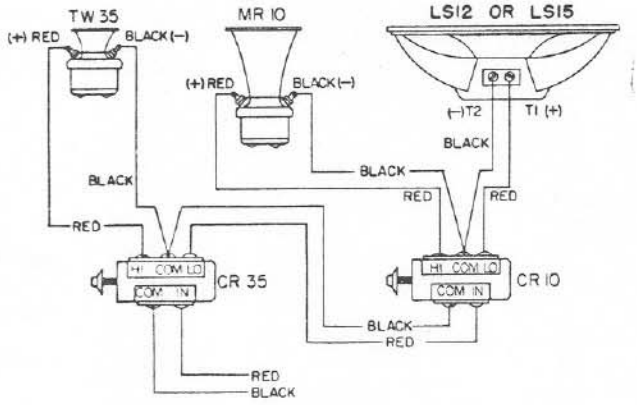


Figure 10 — Wiring Diagram Three-Way System

cable. If the speaker is connected to a Williamson type amplifier, capacity between long leads may induce oscillation, resulting in instability and distortion from the amplifier. The remedy is to use television twin-lead.

The positive lead from the loudspeaker should be connected to the 8-ohm tap on the amplifier; the negative lead to the common tap.

ASSOCIATED COMPONENTS—The quality of sound from your Wolverine speaker system will be limited only by the performance of the other components in your high-fidelity system. For the most realistic reproduction from your favorite records, Electro-Voice compatible stereophonic-monaural phonograph cartridges are recommended. These cartridges will not only give smooth, distortion-free reproduction from standard monaural records, but will also equip you for the new stereophonic records.

A quality record changer or turntable should be used with your Wolverine components. The changer or turntable should have minimum rumble and be capable of constant speed to eliminate wow and flutter.

The amplifier used with Wolverine speakers should produce less than 1% harmonic and intermodulation distortion. If the amplifier has a variable damping factor control, it should be set at maximum, although no qualitative difference will be observed past a setting of 10. Because of the high efficiency of Wolverine speakers, no more than 15 watts of amplifier power is actually required, although two or three times this amount may be used if desired.

OPERATION

OPERATION OF LEVEL CONTROLS — Level controls are provided for adjusting the amount of energy fed to the mid-range and/or VHF drivers. The MF1 level control works in the frequency range between 1000 and 3500 cps, while HF1 level control governs the amount of energy radiated above 3500 cps.

Generally, because of the increased efficiency of these high-range drivers, the controls should be adjusted to a setting of 4. Exact positioning of these controls will depend upon room acoustics and should be adjusted for most pleasing reproduction. Rooms furnished with heavy rugs, drapes, and overstuffed furniture will require a more advanced setting of the VHF driver control than average. To achieve a "front row" effect, advance the mid-range driver control.

TESTING YOUR SYSTEM — You are now ready to listen to your new Wolverine speaker system. In testing your system, only new or well cared for phonograph records should be used. Naturally, if the sound on the record is already distorted, distortion will be reproduced by the speakers. For a critical check of your system, a technical test record, such as the Cook Series 60 Chromatic Scale Test Record, should be used.

Your Wolverine speaker system will open up new areas of musical enjoyment to you, and your pleasure in the system will grow with the years. Good listening!

GENERAL INFORMATION

SHIPPING DAMAGE — Wolverine components are packed in accordance with all shipping requirements of the Interstate Commerce Commission plus extra protection. If shipping damage occurs, contact the carrier directly, requesting inspection and instructions. Use the serial number of the speaker in your correspondence.

SERIAL NUMBER — The serial number is noted on the cover of this instruction booklet, and on your warranty registration card. The serial number indicates type, style and date of manufacture of the unit. Always use the serial number in your correspondence.

WARRANTY CARD — To register your Wolverine components, fill out the Warranty Registration Card and send it to the factory within ten days after your purchase. It is not necessary to fill in the Market Research Information on the card, but it will be of great help in supplying you with more and consistently improved high-fidelity products. The Warranty Card will also put you on the Electro-Voice mailing list for future technical publications.

SPEAKER REPAIRS — Should your Wolverine components become damaged or develop faulty operation from unusual conditions of employment, Electro-Voice maintains a complete service department to put the equipment in factory new condition. If it becomes necessary to return the equipment for repair, please write for authorization, shipping instructions, and location of repair depots.

TECHNICAL SERVICE — The distributor from whom you purchased your equipment knows thoroughly the application of Wolverine products and high-fidelity techniques. His advice on the installation of Wolverine components and on the selection of associated high-fidelity equipment will be invaluable. Technical problems which cannot be answered locally must be referred to:

Manager
Wolverine Division
Electro-Voice, Inc.
Buchanan, Michigan

When writing, please list the manufacturer and model number of all components used in your high-fidelity system.

Electro-Voice® / ELECTRO-VOICE, INC.
BUCHANAN, MICHIGAN

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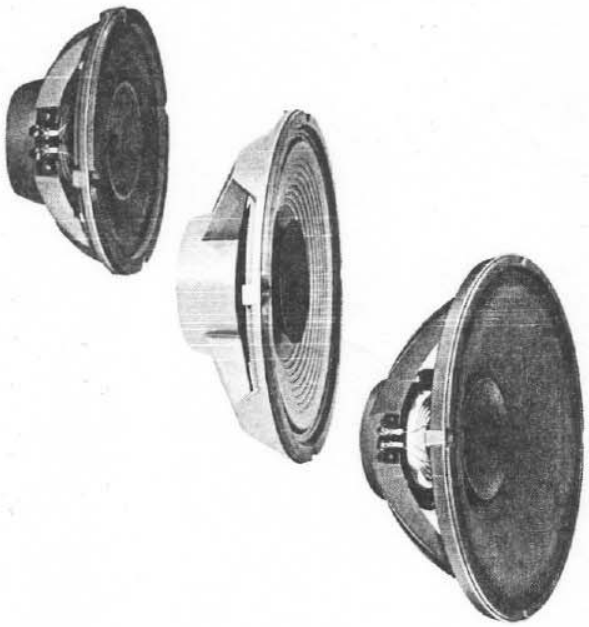


DESCRIPTION

Wolverine LS8, LS12A and LS15 loudspeakers are designed to operate effectively both as full-range speakers and as low-frequency drivers in multi-way systems. Full-range reproduction is enhanced by the exclusive Radax design. The dimensions, mass and location of the coaxially mounted Radax cone have been carefully chosen for maximum improvement of the speaker's high-frequency performance. Carefully selected and specially treated cone material assures extended bass response, affording pleasing reproduction of all low frequencies normally encountered in music.

INSTALLATION

As with any quality loudspeaker, care should be taken to house Wolverine speakers properly if best results are to be obtained. Excellent results may be achieved by the use of a properly designed bass reflex enclosure. Detailed information on home construction of bass reflex enclosures is available from Electro-Voice in Technical Bulletin No. 10. Any of the bass reflex enclosures described in numerous articles may be employed, provided they are intended for a speaker of the same size and resonant frequency as the Wolverine speaker to be used.

To mount a Wolverine speaker, cut a baffle opening and drill mounting holes as indicated. Use four carriage bolts, nuts and washers, or equivalent; use of woodscrews is not recommended. Secure the speaker to the baffle board just tightly enough to compress the speaker gasket. Excessive tightening is not necessary as the compressible gasket will form an acoustical seal with nominal pressure.

CONNECTIONS

Use #18 or larger fixture wire to connect the two terminals on the loudspeaker to the amplifier output. To insure proper phasing, the speaker T1 terminal should be connected to the 8 ohm amplifier tap; the T2 terminal should be connected to the amplifier common tap. The 8 ohm impedance of Wolverine speakers is a standard EIA rating. A mismatch of as much as 50% may be made without greatly affecting the reproduction quality or efficiency of the unit. When the speaker cable must be run under carpets or behind moldings, etc., ordinary T.V. twin lead is satisfactory.

SPECIFICATIONS

	LS8	LS12A	LS15
Frequency Response:	45 to 14,000 cps	40 to 14,000 cps	35 to 14,000 cps
Nominal Impedance:	8 ohms	8 ohms	8 ohms
Power Handling Capacity:			
Program:	20 watts	20 watts	20 watts
Peak:	40 watts	40 watts	40 watts
Voice Coil Diameter:	2"	2"	2"
Magnet Weight:	6.8oz. Alnico V	13oz. Cer. Indox	13oz. Cer. Indox
Nominal Resonance:	75 cps	65 cps	50 cps
EIA Sensitivity Rating:	43 db	45 db	47 db
Dimensions:	8-3/8"dia.x 3-1/2" overall depth	12" dia.x 3-15/16" depth	15-1/8"dia.x 6-11/32" depth
Net Weight:	4 lbs. 8 oz.	5 lbs. 8 oz.	9 lbs.
Baffle Opening:	7-1/8"	11"	14"
Mounting:	Four 9/32" holes equally spaced on circle of 7-5/8"	11-1/2"	14-1/2"

SYSTEM IMPROVEMENT

Wolverine Step-up kits provide a simple method for improving speaker system performance in stride with the budget. A single loudspeaker may

be expanded to a deluxe 3-way system without obsoleting existing components, and with the assurance of properly matched components.

Model HF1 high frequency Step-up Kit should be the first addition to a Wolverine full range speaker. In addition to extending high-frequency response to beyond the limits of audibility, this Step-up Kit provides more precise definition of VHF wave forms and improved high-frequency dispersion in the listening area.

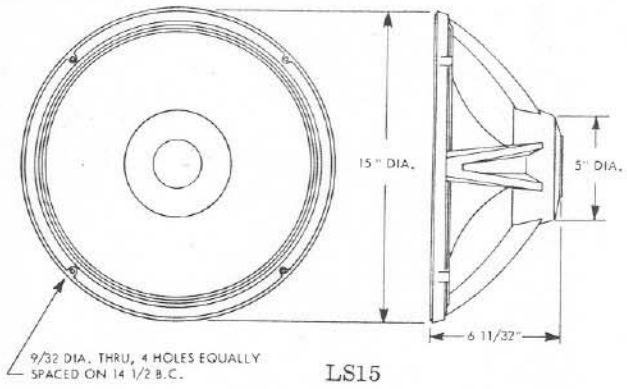
If a further improvement in performance is desired, the final addition should be an MF1 mid-range Step-up Kit. The audio range is thus divided for more efficient reproduction of each frequency section, lowering both harmonic and intermodulation distortion. The improved mid-range performance provided by the MF1 is especially important because instrument and voice harmonics which determine the character of the sound are found in this frequency range.

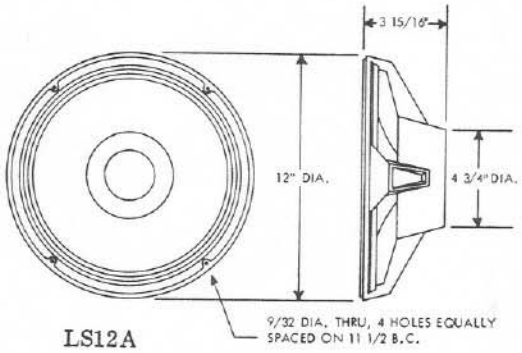
CUSTOMER SERVICE

Wolverine speakers are packed to provide protection well in excess of shipping requirements of the Interstate Commerce Commission. If shipping damage does occur, contact the carrier or the dealer from whom the unit was purchased, and request inspection and instructions.

WARRANTY

Electro-Voice Sound Reinforcement & Public Address 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.





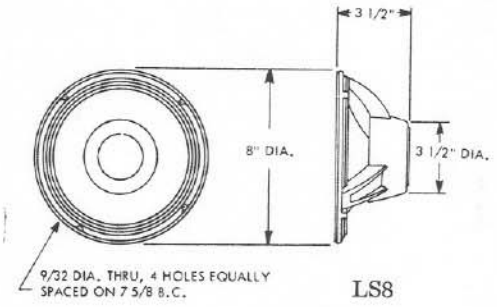


Figure 1-Dimensions

Part No. 531462 – 330