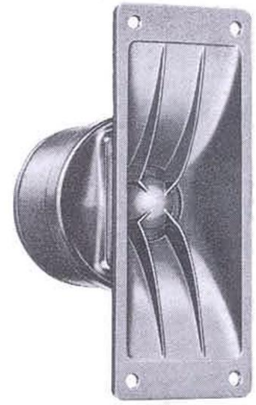
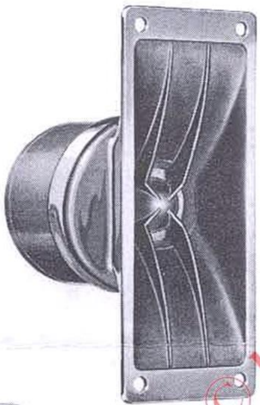
Electro-Voice®

ELECTRO-VOICE, INC.
BUCHANAN, MICHIGAN

Specifications and Instructions Models T35B, T35 and T350

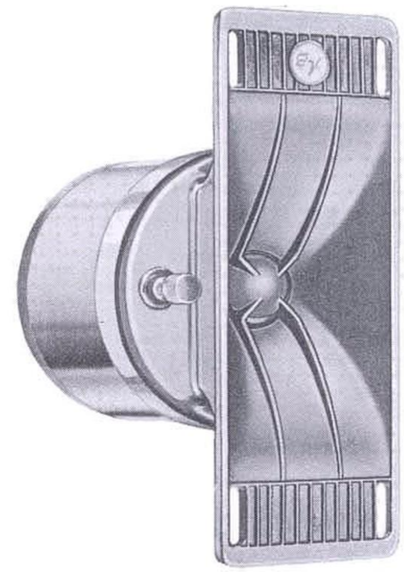


Model T35B



Model T35

Model T350



The human ear delights in the variety of sounds resulting from the widest range reproduction. This wide range response delivers also the subjective illusion of reality. Extended high-frequency response in the last audibile octaves is made necessary still more in the accomplishment of musical balance with the augmented bass range of present speaker systems of the folded corner horn and phase loaded type. Here fundamentals of the first audible octave require flat response in the high range to the limit of audibility, or aesthetic appreciation of the source material suffers from unconscious listener fatigue caused by the imbalance.

These needs have resulted in intensive research by Electro-Voice physicists and engineers to the end that new principles and new techniques have evolved a superior series of VFH drivers which have overcome range and sensitivity limitations.

The improved T35B, T35 Super-Sonax, and the T350 Ultra-Sonax very-high-frequency drivers are designed to complement all Electro-Voice speaker systems, and systems of alternative manufacture, when smooth, efficient, extended response is desired past 3500 cps. These drivers have specialized integral horns of the diffraction type which afford wide dispersion. This dispersion characteristic is especially valuable in stereo or binaural reproduction, where even distribution of sound energy throughout the listening area is a requisite to preserve the proper aural horopter.

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.

Through these means, frequency response is sustained ±2 db to 20 kc, with response down only 8 db at 40 kc. 8 db is considered to be the half-loudness point, if it were to be considered that 40 kc could be heard under any condition.

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 distri-

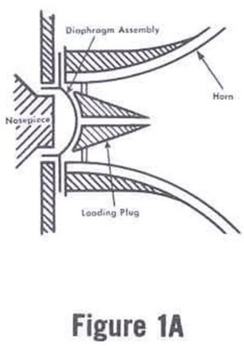


Figure 1A

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

Figure 1B

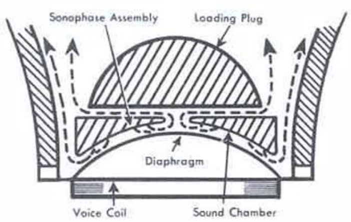


Figure 2

Figure 3A

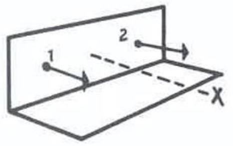


Figure 3B

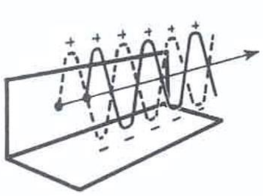


Figure 3C

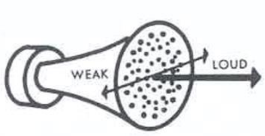


Figure 3D

bution, 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 the figures.

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

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

FIGURE 3C — But in this figure, 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 — This figure will show 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.

FIGURE 3E — In this figure 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 — This figure 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 obvious 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

	T35	T35B	T350
Frequency Response:	±2 db 3.5 kc to 19 kc	±2 db 3.5 kc to 18 kc	±2 db 3.5 kc to 21 kc
Recommended Crossover:	3500 cps	3500 cps	3500 cps
RETMA Sensitivity Rating:	57 db	54 db	60 db
Polar Pattern:	180° dispersion	180° dispersion	180° dispersion
Power Handling Capacity:			
Program Material	50 watts	50 watts	50 watts
Peak	100 watts	100 watts	100 watts
Nominal Impedance:	16 ohms	16 ohms	16 ohms
Voice Coil Diameter:	1 inch	1 inch	1 inch
Magnet Weight:	7 oz	4 oz	1 lb
Gauss	13,500	9000	20,000
Size:			
Horn	5¼ in. long x 2 in. wide	5¼ in. long x 2 in. wide	7½ in. long x 2⅞ in. wide
Pot Diameter	2¼ in. maximum	2¼ in. maximum	3½ in. maximum
Depth	3¼ in. overall	3 in. overall	4¼ in. maximum
Mounting:	See diagrams	See diagrams	See diagrams
Baffle Opening:	1¾" x 4¼"	1¾" x 4¼"	4⅞" x 2⅝"
Net Weight:	2¼ lbs.	2 lbs.	7 lbs.
Shipping Weight:	3½ lbs.	3 lbs.	9½ lbs.
Price: Net	$35.00	$22.00	$60.00

Recommended Accessories: X36 crossover network, Price, Net: 9.50. AT37 level control, Price, Net: $3.90

INSTALLATION

Read completely the following instructions before installing the driver.

MOUNTING —The Super-Sonax and Ultra-Sonax VHF drivers are shipped with a mounting bracket as standard equipment. See Figure 4 for mounting diagram. The four round-head wood screws are employed to mount the bracket on any flat wood surface. When using these drivers in an airtight enclosure or infinite baffle, the bracket is not required. A slot of the dimensions shown in the diagrams should be cut vertically in the mounting panel. The thickness of the baffle is of no consequence as the straight-horn section thus formed will act only as an acoustic transmission line.

PHASING — No phasing is necessary because of the small dimensions of the wavelengths involved. As long as the VHF driver is mounted at least one inch away from the next driver of lower frequency, no interaction of consequence will be involved.

GRILLE CLOTH —The dull black finish of the horn mouth and mounting bracket prevents these assemblies from being seen through a grille cloth. Use at least 60/40 open mesh. A more dense grille cloth will seriously attenuate the higher frequencies, especially those above 10,000 cps. The new plastic grille cloths are not only decorative but strong and will not stretch or tear. These may be purchased from your distributor in many patterns and colors.

WIRING AND IMPEDANCE MATCHING — Reference to Fig. 4 will show the method of wiring to an existing speaker system. Use No. 22 fixture wire or larger to connect the two terminals on the driver to the AT37 level control, and the AT37 to the HIGH or VHF output terminals on the crossover network. Though the crossover frequency may be as low as 3000 cps, to eliminate the possibility of horn cutoff frequency disturbances, 3500 cps is recommended. The 16-ohm impedance of the driver units is a standard RETMA rating and is indicative of the voice-coil impedance at crossover frequency. A mismatch by as much as 100% may be made without noticeably affecting the reproduction or efficiency of the unit. It is recommended that when the E-V X36 crossover network is used with an existing 8-ohm driver, the 16-ohm tap on the output transformer be utilized as the mismatch will favor the lower frequencies in the bass units.

ADJUSTMENT OF LEVEL CONTROL — The usual high-quality driver employing from 3 to 6 lbs. of Alnico V magnet material has an efficiency rating of about 50 db. This means that the T35 and T350 will be too efficient for a proper musical balance unless a loss pad, preferably variable (such as the E-V AT37), is employed. The same applies to the T35B with complementary drivers with about 1 to 2-lb. magnets. This extra sensitivity in the VHF drivers is very necessary in order to provide the high efficiency necessary to effect smooth, damped, and extended high-frequency response.

If the T35 and T350 are used with drivers of lower magnet weight than the types mentioned above, the AT37 control should seldom be opened more than half-way. The subjective effect with the "shelved-up" high range will manifest itself in a "gurgling" character being given to the signal. The moment the bass response is increased or the high range is decreased, the ear will recognize the critical point instantly and without hesitation if the input signal is clean and extended in range. Thus the user may control musical balance with absolute precision regardless of local conditions.

It may be seen from the considerations just given that absolute settings for the brilliance control cannot be stated. The exact setting will vary with the high frequency absorption coefficient of the room as controlled by rugs, drapes and overstuffed furniture.

AMPLIFIER DAMPING CONTROL SETTING — If your amplifier has a variable damping control, as do all E-V units, set this control in accordance with the setting shown in the instructions for the LF

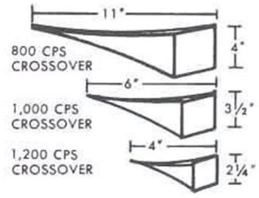


Figure 3E

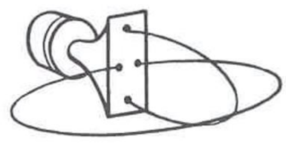


Figure 3F

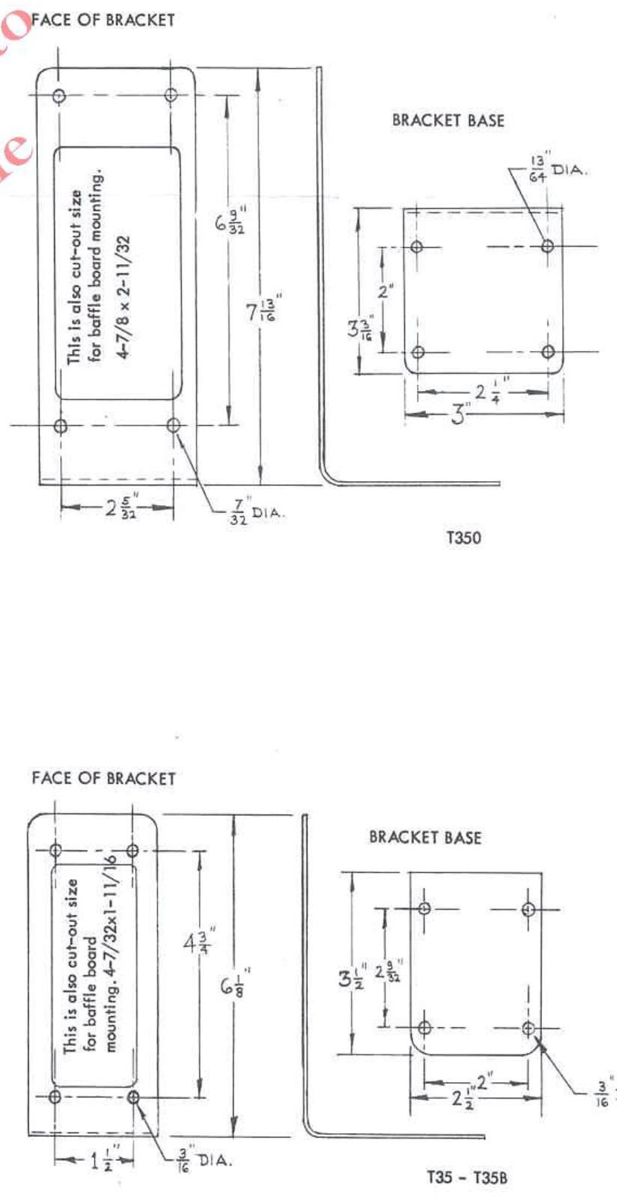
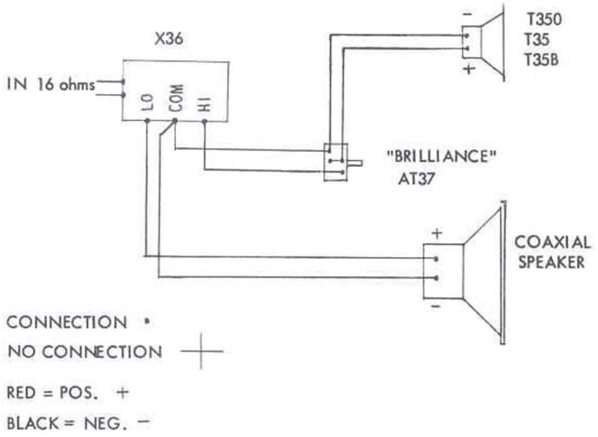
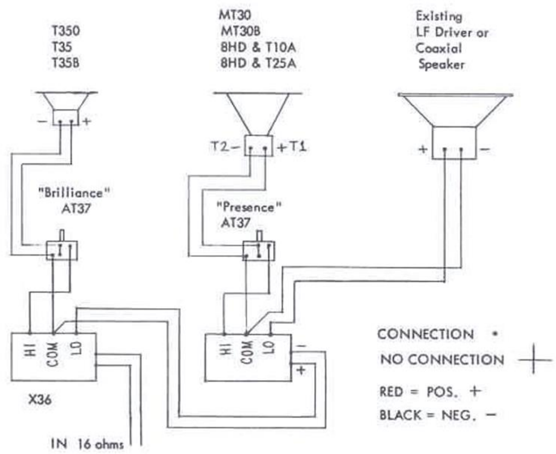


Figure 4

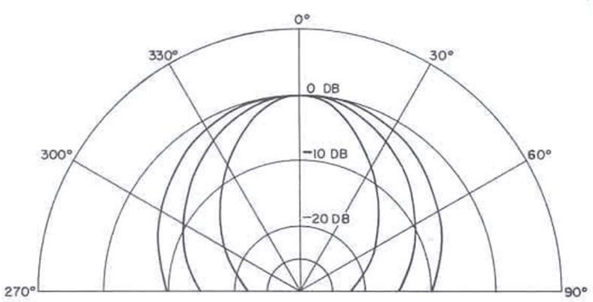


Schematic Wiring Diagram
3-Way or Separate 2-Way System



Schematic Wiring Diagram
Separate 3-Way System

Figure 5



Polar Response

Frequency Response

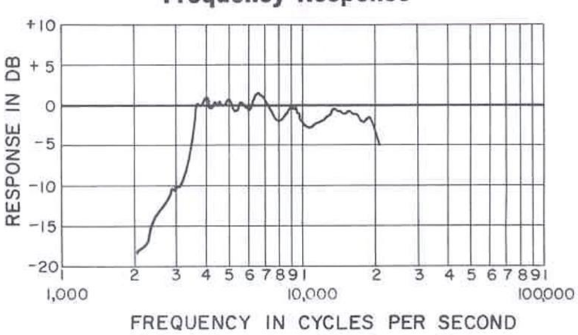


Figure 6

driver. Damping factor controls do not affect significantly HF driver reproduction above 1000 cps.

CAUTION NOTES

POWER HANDLING CAPACITY — In program material feeding through a 40-watt amplifier, for example, only occasional peaks reach this power. The actual average power is much less throughout the musical range; less than 3% of the total energy in comprehensive musical passages lies above 3500 cps. This energy is composed of transient signals which never reach a steady state for long periods. Accordingly, it will be seen that the loudest passages above 3500 cps seldom reach a total of one watt. The lowest frequency reproduction recommended for these units is 3500 cps, and attenuation below this point should occur optimumly at the rate of 12 db per octave. This attenuation is afforded by applicable E-V crossover networks.

TEST PRECAUTIONS — A sustained tone from an oscillator, such as is used for test purposes, may be employed on the units for short periods with up to 5 or 7 watts of power, but at the end of five minutes or so, tremendous heat builds up in the sensitive driver and damages the coil. For this reason, such tests must be of short duration. Naturally, sustained signals of this kind are never remotely approached in program material.

PRECAUTIONS IN TAPE MACHINE OPERATION — If the speed of a tape machine is advanced beyond the normal speed, high-frequency power is increased at the rate of 6 db per octave over normal for each doubling of tape speed. On fast forward or rewind supersonic energy of great magnitude may be generated, even though the head gate is open. Always reduce volume during this process, even though the signal is inaudible. This is especially important in fast editing procedures, where the gate is frequently only partially opened so that the tape traverse can be cued audibly.

UNSTABLE AMPLIFIERS — Supersonic oscillation may occur in an amplifier whereby high power inaudible sine wave signals may generate damaging heat in the driver units. Such oscillation may be detected with an oscilloscope, or by the presence of heat in the driver unit by feeling the pot structure of the driver. This can be corrected in some cases by using low-capacity television twin-lead between the amplifier and speaker system.

CHANGING TUBES WHILE AMPLIFIER IS ON — Another cause of excessive power application is the changing of amplifier tubes in low-level stages while the system is operating, when the volume control is advanced. The removal or plug-in of the tube generates a tremendous surge, many times in excess of the rated amplifier power. This will damage sensitive VHF driver units, treble drivers, and sometimes cone speakers. Defective switching units in the amplifier can cause a similar effect.

FEEDBACK — Feedback frequently occurs when the input and output leads of an amplifier are brought into proximity with each other. This feedback often is inaudible, occurring at super-sonic frequencies. Under such conditions, high overloads occur and, therefore such feedback should be guarded against.

Acoustic feedback, resulting when the speaker feeds back into a microphone, microphonic tubes, and feedback caused by mechanical vibration from a speaker adjacent to the pickup or turntable, should be avoided. Feedback of this nature will build up at a continuously accelerating rate until some link in the reproducing chain fails, the amplifier "flat tops," or the power is reduced below the point of critical excitation. Because damage to treble and VHF units may transpire, due caution should be exercised.