



# Owner's Manual

CD series type 35  
CD series type 35i  
with Direktor™ Midrange and  
Tweeter assemblies

**Electro-Voice®**  
Controlled Directionality  
Time Coherent System

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# Electro-Voice

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## PREFACE

In the material to follow we would like to tell you about how to hook up, operate, locate and adjust your Electro-Voice loudspeaker system. We would also like to tell you something about ourselves and some detailed characteristics of your Electro-Voice system. (We're not really that vain — it's more like wishing to chat with a music loving friend about what we've done and why because we're proud of the system that represents us to you.)

If you wish to have your newly-acquired system operating in minimum time (so as to enjoy your favorite music), we are highly sympathetic. Complete operating instructions begin on page 3. After all, the enjoyment of music, rather than history or technical details, is probably paramount in your mind at this moment. Perhaps sometime, when you're a bit curious about our somewhat unusual company name and what's behind it, you might want to read the section in this brochure about Electro-Voice. If you are wondering about some of the background behind the CD series type 35 and type 35i loudspeaker systems, you may wish to turn to the section on the system itself. In any event — good listening!

## A WORD ABOUT ELECTRO-VOICE

Electro-Voice has specialized in the design and production of electro-acoustic products since its emergence as a microphone company in 1927. Legend has it that the creation of an electric megaphone (soon contracted to electric-voice and Electro-Voice) for a new football coach at Notre Dame, Knute Rockne, got us our name. Our interests were expanded into the loudspeaker area shortly after the introduction of the "long playing" (33-1/3 RPM) record in the late 1940's. We then designed systems and components for the new and exciting concept of high quality music for the American home. Electro-Voice systems, such as the Patrician®, Georgian™ and Aristocrat®, made a mark for themselves as early examples of the best that was to be had in high quality music reproducing instruments. Through them, electrical impulses from modest power amplifiers (in contemporary terms) were almost magically translated into an awesome and thrilling experience reminiscent of a concert hall. Since that time Electro-Voice products have found their way into outer space (as loudspeakers for the Skylab project) and auditorium, stadium and portable sound applications (e.g. Yankee Stadium, Pontiac Silverdome, the Montreux Jazz Festival, and others too numerous to mention) throughout the world. In a very literal sense music has been, and will continue to be, our business.

In another sense we have been a somewhat modest company whose products, accomplishments and service have been more known to professional users, (who must depend upon reliable and well-designed products as "tools" of their trade) than to the general public. However, the lessons learned in the development of tools to satisfy professional acoustic applications have resulted in the accumulation of a body of acoustic knowledge that has contributed to perfecting highly advanced systems for domestic applications. Many concepts, such as:

- a) Informed and optimized system design through the pioneering use of computers<sup>1</sup> (rather than seat-of-the-pants design approaches).
- b) Advanced and sophisticated driver design (linear diaphragm displacement at high acoustic output levels and undercut pole piece geometries for symmetric magnetic field structures).
- c) A concern with the implications of being able to manipulate loudspeaker directionality<sup>2</sup> (controlling the where and why of the directions covered by the acoustic energy emanating from the loudspeakers constituting a system).

were pioneered and put into practice in Electro-Voice products. You can enjoy your new speakers with pride and confidence — assured that Electro-Voice engineers have put this wealth of experience and competence together in the CD type 35 and type 35i; and that they employ the absolute latest in valid technology and design technique.

We would like to present ourselves in a meaningful way, with refined products, to a world dominated by exaggerated performance claims and overblown "breakthroughs". The CD type 35 and type 35i are for those who appreciate well-executed, aesthetically appealing products that will satisfy sophisticated music listeners for many years.

As a company concerned with almost all aspects of sound reproduction, we say "à votre santé" — a toast to all lovers of music throughout the world.

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## THE CD SERIES, TYPE 35 and TYPE 35i LOUDSPEAKER SYSTEMS

The CD series, type 35 and type 35i brings together many design concepts our company has originated over the years in the form of a visually pleasing system that can satisfy both the ear and eye. The thin, angled basic geometry of the system enclosure marries a proven "low diffraction" acoustic enclosure<sup>3</sup> with an aesthetically pleasing shape that can be fitted into most styles of listening room decor. Housed within this casing are three precisely designed loudspeakers which are uniquely meant for this system concept and no other. These loudspeaker elements are stacked in a vertical array within the enclosure resulting in automatic symmetry between the geometry of the left and right system. This is a preferable arrangement for more accurate stereo imaging.

Starting at the bass end there is a 30-centimeter woofer that is specifically designed for the chosen internal cabinet volume in such a way that maximum performance from this volume of space is achieved virtually without compromise. This is a consequence of our ten-year awareness and development of the acoustic design concepts of A. N. Thiele and Dr. R. Small,<sup>4</sup> which we introduced to the industry in the form of the Interface:A system of 1972.<sup>5</sup> This bass section is a compatible and integral fusing of pre-designated spacial volume and woofer parameters so as to truly achieve the full, conceptual meaning of the word system. The woofer features a smoothly responding cone fabricated from clear polypropylene material to enable a seamless transitioning to the dome "direktor" midrange.

This unit is designed from prior experience with controlled-directionality devices. Although not immediately evident, this structure controls the output from the 3.8-centimeter hemispherical acoustic source in a specific way that permits matching of the midrange spacial coverage to that of the 30-centimeter low-frequency driver in a highly compatible manner and at a carefully selected crossover frequency. The specially shaped direktor element, in front of the dome, controls acoustic radiation so as to have virtually every frequency directed into a defined and sufficiently wide volume of space. This characteristic controls acoustic output in a subtle manner so as to stabilize stereo imaging throughout the vital midrange-to-tweeter frequency band. The lower and upper registers of the human voice, for instance, are directed so as to interact with listening room surfaces in a uniform manner. In this way, lower registers interact with the same room reflecting surfaces as do treble register sibilant sounds. This control characteristic is why we chose to designate the system as being of the CD series (*for controlled directionality*) type. This midrange loudspeaker smoothly transitions to the 2.5-centimeter tweeter driver at 8 kHz.

The tweeter diaphragm is formed of a high strength space-age material called "Kevlar®" which is notable for its high strength and low mass. The Kevlar diaphragm exhausts its output through its own specially designed direktor which continues the controlled spacial characteristics of the midrange direktor up through extremely high frequencies. This subtle refinement in the extreme treble preserves control over acoustic radiation past the limits of human hearing. Cymbals and the upper harmonic registers of synthesizers are given the same measure of careful control that begins with the bass driver and is sustained through the midrange reproducer. These three acoustic elements (or "drivers") are pieced together through the most detailed crossover network ever designed for any Electro-Voice system. This crossover has special compensating circuitry built into it to ensure smooth system response and uses premium quality polyester film capacitors in critical circuit paths. The crossover frequencies and time coherence between drivers are controlled in such a manner so as to seamlessly integrate the various acoustic elements of the system into a harmonious whole. (In the type 35i we provide controls for the midrange and super tweeter drivers that permit limited but effective tailoring to be achieved for various room acoustic absorption characteristics and personal preferences in the area of detailed sonic balance. These controls are discussed in a later section of this brochure. Also discussed in a later section is the "power sentinel" feature located adjacent to these controls.)

The careful integration of the drivers in this system has several additionally beneficial characteristics. The controlled spacial coverage zones largely eliminate a characteristic called "diffraction effects" as a natural consequence of their inherent control. At some frequencies (usually at the lower extremes of the midrange and tweeter frequency bands), uncontrolled acoustic radiation can become involved in a complex manner with the discontinuities presented by the enclosure boundaries causing response irregularities to be

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introduced at listening distance. The control exercised by the direktor concept effectively prevents this involvement by channeling output away from these boundaries, permitting diffraction effects to be minimized through a natural and planned design concept. The direktors also permit, in an equally natural manner, correction of time delay irregularities. Time delay is a concept related to the arrival, at different times, of acoustic energy from the various drivers constituting a system. To a large degree, this is due to the acoustic "sources" of the various drivers being at various distances from the listener. Since the direktors, by their very nature, place the actual radiating surfaces (the dome diaphragms) at a distance slightly behind the baffle, it is possible to have all radiating sources essentially equal in distance (and therefore time) from the listener. This pleasant side benefit means that the "acoustic center" of the large 30-centimeter woofer (which because of its very size is several inches in back of the baffle plane) can effectively be moved forward by virtue of the rearward displacement of the midrange and tweeter diaphragms behind the baffle as a natural byproduct of the depth of their direktors. This is all accomplished without the use of "stepped" loudspeaker baffles which can sometimes result in undesirable sound reflection and diffraction due to the surfaces placed in front of midrange and tweeter units.

The reference efficiency level of this loudspeaker system is relatively high in that the conversion of electrical-to-acoustical energy slightly exceeds 1% in an acoustic half-space environment (i.e., the loudspeakers radiating outward from a flat wall type of surface). This level is about 3 to 6 dB higher than that featured by many acoustic suspension forms of loudspeaker systems.

For you, as a music listener, this implies that a medium size 30-watt-per-channel amplifier is capable of generating acoustic levels approaching 110 dB on short duration musical peaks (usually implying longer term average levels approaching 100 dB) in the listening area of a typical living room. The system is also durable enough to permit use with amplifiers of up to 400 watts when care is exercised to avoid signal "clipping". This capability will become increasingly desirable with the growth of interest in digitally mastered analog, direct-cut and dbx-encoded disks. It will become even more desirable with the introduction of the true digital disk. In the case of these types of material, the potentially powerful low bass range will be well addressed by the 30-centimeter woofer in its integrally designed vented enclosure. For those of you interested in knowing more about the implications of digital technology, the material in reference one is suggested for additional reading.

In any event, we hope that this admittedly somewhat technical description of your type 35 or type 35i may be of interest in explaining why your recordings sound as detailed and pleasant as they do when reproduced through your newly-acquired musical instrument that reproduces all musical instruments.

### UNPACKING

Unpacking the CD series speaker systems is straightforward, with no special precautions necessary. However, if at all practical, *retain all packing materials for possible future use* (see "Customer Service" section).

### CONNECTING THE SPEAKER SYSTEMS

#### Input Connections

The two terminals on the terminal board at the rear of the speaker enclosure are the input connections. The common ( - ) terminal should be connected to the common output terminal of the amplifier and the other ( + ) terminal to the amplifier's + terminal. Use of tools is not required. Make certain the bare wires do not touch each other.

#### "In-Phase" (Like-Polarity) Speaker Operation

Connecting the speakers as described above produces in-phase operation, an important condition for best stereo performance. This ensures that the speaker cones are moving in unison when the same signal is present at each set of amplifier output terminals. Such a signal condition occurs with monaural program material and, in stereo, with soloists or groups located midway between the two speakers.

In-phase operation results in a satisfyingly "solid" center image. Out-of-phase operation produces a spread, indefinite center image that changes location and character as the

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listener moves a foot or two back and forth between the speakers. Also, out-of-phase operation may reduce bass response, depending on room dimensions and speaker/listener locations.

An experienced listener can successfully test for in-phase operation by noting the quality of the center image on monaural program material. However, the least ambiguous check is to set the two speakers facing each other, an inch or two apart. Use program material with fairly prominent bass content and switch the amplifier to the monaural mode. This is usually accomplished by pressing a Mono or A+B button or lever, or moving a rotary switch to a similarly labeled position. Reverse the wires to *one* of the speakers (either at the speaker end or the amplifier end, *but not at both*). This will either increase or decrease the bass output. The correct connection is the one that produces the most bass.

### Wire Selections

To avoid any significant amplifier power loss or significant system impedance alteration in the speaker lines, 18-gauge standard wire (commonly called lamp cord or zip cord) is usually satisfactory for lengths up to 30 feet. If long speaker lines are required, use progressively larger wire sizes: 16-gauge to 50 feet, 14-gauge to 75 feet and 12-gauge to 125 feet. Always use a separate pair of wires for each speaker, even if your amplifier permits using a common ground. Resistance in a common ground wire can degrade stereo separation.

If you so choose, almost any of the available "high performance" lead wires may be used as the speaker terminals permit insertion of these usually large diameter wires.

### SYSTEM PLACEMENT

Placement of stereo speakers is more often determined by floor plan and furniture arrangement than by acoustic considerations. There are some general guidelines which may be helpful, however.

#### Preferred Locations

Usually it is possible to select a normal listening area (a sofa, chair grouping, or whatever) in the listening room. The speakers should face the listener with no obstructions between the speakers and the listener. The type 35 and type 35i are designed for balanced performance when placed within an inch or two of one wall, several feet away from room corners.

Spacing between the speakers is important. If the speakers are too close together, stereo separation will be reduced. Conversely, if the speakers are too widely spaced, the stereo image may be disjointed with a gap in the middle. In most rooms, a speaker separation of 6 to 12 feet will provide a good stereo image. A good guideline is to have an angle of about 30° to 50° between speakers, when viewed from the listening position. Feel free to experiment.

#### Sound Quality and Speaker Location

There is no doubt that different listening rooms and changes of speaker location within a given room can affect sound quality to an extent important to many enthusiasts. Some changes are subtle, while others are quite noticeable.

It is possible to theoretically predict and categorize many effects if room characteristics can be simply defined. However, real listening rooms are usually sufficiently irregular and complex to dilute and alter the clear-cut effects that might be predicted theoretically.

It may be helpful to note that moving speakers into the corners of the room will increase the amount of bass and mid-bass heard. Although the type 35 and type 35i systems are not specifically designed for this placement, some users may find this form of system balance to their liking. However, the unusually wide, uniform high-frequency dispersion of the type 35 and type 35i makes them less sensitive than many other designs to less-than-ideal corner placement.

### SYSTEM TONAL ADJUSTMENTS (Type 35 Only)

Generally speaking, the more sophisticated the listener, the less he or she uses the tone controls on system electronics. We suggest the minimal use of loudness, bass, treble,

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and the like will result in better overall performance in most cases. The loudspeaker system has been carefully adjusted for proper sonic balance in the great majority of normal listening rooms. In the circumstances of having brightly balanced program material, an unusually bright or dull listening room or listener preference for slightly different high-frequency level; the amplifier's high-frequency or treble control may be used to reduce (or, in very rare cases, advance) high frequency balance to a suitable degree.

### SYSTEM EQUALIZATION CONTROLS (Type 35i Only)

As with the type 35 above, we suggest that minimal use of loudness, bass, treble and the like will result in better overall performance in most cases. Equalization controls are provided on the type 35i which may be helpful to you by permitting subtle but effective adjustments of mid-frequency ("presence") and high-frequency ("brilliance") ranges to better suit the listening environment, your tastes, or the nature of the program material being played. In general, the "flat" positions will compliment cleanly recorded, wide-range program material in normal rooms. The reduced or advanced "presence" settings may be used to alter, in a controlled manner, the parts of the musical spectrum often associated with projection of middle-to-high range frequencies — especially those associated with the human voice. The "brilliance" settings may be helpful in altering the very high frequencies, especially in the cases of less cleanly recorded material, brighter sounding rooms, or a listener preference for less high-frequency level.

### AMPLIFIER POWER AND SOUND PRESSURE LEVEL RECOMMENDATIONS

Casual discussions of amplifier power requirements usually result in a wide range of "answers." This is so because power levels vary *immensely* with speaker efficiency, room acoustics, and desired listening levels. Nevertheless, the following commentary should help produce an answer that is right for you. Fortunately, the discussion can be simplified by fixing some of the variables. First, the efficiency of the type 35 and type 35i is assumed. Second, the recommendations are based on a listening room of average acoustics (a precise description of these "average acoustics" follows in the section entitled "Room Acoustics and Amplifier Power"). With these variables fixed, we must deal only with the question of appropriate listening levels and the amplifier power required for these levels.

**Notes on Amplifier Power Ratings.** All amplifier power recommendations are given in average sine wave watts (sometimes called "RMS" or "continuous" watts) per channel, all channels operating, over a minimum frequency range of 30 to 15,000 Hz. Common deviations from this rating method will not change attainable listening levels significantly. Also, to simplify the discussion it is assumed that the amplifier is well behaved when operating at or slightly beyond its power output capability.

**Notes on Listening Levels.** All listening levels are expressed as sound pressure levels in decibels (dB). The dB is a term frequently used in audio but often misunderstood. For example, very few people have a real conception of what a "90 dB" sound pressure level sounds like. We hope to clarify this situation. Furthermore, the audible effect of specific increases and decreases in sound pressure level are not commonly known. A 1 dB change in overall program level is just audible to the critical ear. A 3 dB change is noticeable, but would be interpreted as only a modest change in level. Yet a 3 dB level increase requires a *doubling* of amplifier power output (i.e., going from 20 to 40 watts). A 6 dB change in level would seem fairly substantial; such an increase requires four times amplifier power (i.e., going from 20 to 80 watts).

**Notes on Listening Position.** The sound pressure levels noted below are those observed when the listener is in the "reverberant field" of the listening room. Sound pressure levels are highest very near the speakers. As the listener moves away from the speaker, the sound pressure level drops, as would be expected. However, in a room with average acoustics and with the type 35 and type 35i, this drop in level *stops* at about 6 feet from the speaker. Beyond this distance, the listener is in the reverberant field and the sound pressure level of wide-range program material remains virtually constant because nearly all of the audible sound energy is reflected energy.

### Minimum Recommendations

**Sound Pressure Level.** It has been said that a sound pressure level of 85 dB is the

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maximum average intensity people want to experience in their homes.<sup>6</sup> However, it is our considered opinion that a quality music system should be able to provide a long-term average program level of approximately 90 dB in order not to be found inadequate by nearly every serious music listener at some time. It is this so-called long-term average level that the ear interprets as a given loudness over any several-second musical crescendo. Also, it is this average level that is expressed by the relatively slow-moving indicator of a sound pressure level meter.

Additionally, we feel that a music system must be able to reproduce short-duration peaks (on the order of 10 milliseconds) 10 dB higher than the average, or 100 dB. Musical signals are full of such peaks. While they contribute very little to perceived loudness, they are essential to accurate reproduction.

A 90 dB average level will seem quite loud to many people, certainly far above a background music level (60 dB) or the level of ordinary conversation (65 dB). A 90 dB average level is very likely to represent a practical upper limit-of-pleasure for many commercial records where compression and background noise have compromised the integrity of the original signal.

**Amplifier Power.** One type 35 or type 35i speaker system will produce the sound pressure levels described above with a 3 watt amplifier. The 90 dB average level is reached with an input of only .3 watts, with the full 3 watts producing the 100 dB instantaneous peaks.

This amazingly modest requirement is due to the high efficiency of the type 35 and type 35i, about 3-6 dB higher than typical acoustic suspension speaker systems. This means that the type 35 or type 35i's power requirement is only 25 to 50% of that often recommended for these acoustic suspension systems.

### Typical Requirements

**Sound Pressure Levels.** Although the 90 dB minimum recommended average level capability will satisfy a broad range of listeners, this level falls far short of the levels associated with most live music. Many enthusiasts will find live music levels enjoyable for the highest quality commercial program sources and well-executed live recordings. For example, while "loud" classical music reaches only the relatively modest level of 80 dB, "very loud" classical music goes well beyond the 90 dB "minimum" — ranging from 90 to 100 dB. The short-duration peaks required for realistic reproduction can be another 20 dB higher. Loud rock music is on the order of 115 dB average level.<sup>6</sup> It is therefore our opinion that many enthusiasts will find average level capabilities in the 95-100 dB range most appropriate. This means that the sound pressure levels of most live classical music can be attained. For contemporary rock and electronic music, the 95-100 dB capability represents a reasonable compromise among several variables: the actual levels of live rock, typical program sources, and neighbors.

**Amplifier Power.** One type 35 or type 35i speaker system will produce the sound pressure levels noted with amplifiers ranging in capability from 10 (95 dB average level) to 30 watts (100 dB average level). Such levels would require amplifiers from 30 to 90 watts for typical acoustic suspension designs. The long-term average levels are produced by 1 to 3 watts with only the instantaneous peaks utilizing the full capacity of 10 to 30 watts.

### Maximum Recommended Power

Amplifiers much larger than the minimum recommended may be used: up to around 400 watts per channel. However, care and intelligence are required to see that the high power is used *only* to reproduce the harmless, short-duration program peaks that are 10 to 20 dB above the average levels. When this condition is fulfilled, the long-term average power delivered by the amplifier will be within the type 35 and type 35i ratings.

This condition is virtually assured if the signal from the amplifier is distortion-free and accidental inputs are avoided. Damaging accidental inputs include insertion or unplugging of the power cord or audio connectors while the amplifier is operating and dropping the phonograph pickup arm on the record surface under similar volume conditions.

**Sound Pressure Level.** With a 400 watt amplifier, a single type 35 or type 35i will produce an average midband level of 111 dB, with peaks of 121 dB. This means that the levels of

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live rock music can be reproduced. Most high-fidelity speaker systems are incapable of providing such high levels, even with the largest permissible amplifiers. In this context, "midband" refers to the frequency range from about 90 to 1000 Hz. This is the range where both efficiency and power handling capacity are essentially constant, and where most program material is concentrated.

Also, the maximum output ability of the type 35 and type 35i above 1000 Hz is much greater than the usual high-fidelity speaker. The often demanding high-frequency energy content of contemporary studio recordings poses no problem.<sup>7</sup>

Users of high-power amplifiers should refer to the section entitled "Additional Speaker Protection at High Listening Levels."

### Room Acoustics and Amplifier Power

**Description of "Average Listening Room."** The professional acoustician would describe the average listening room used in the preceding discussion as a reverberant space having a room constant (R) of 200 ft<sup>2</sup>. This specification is a direct function of the room's surface area in square feet and the average percentage of sound energy absorbed by the room's surfaces and furnishings. For illustrative purposes, a room constant of 200 ft<sup>2</sup> would result from the following specifics:

1. "Average" sound absorption (average absorption coefficient = .15). This would be provided by plaster ceiling and walls, carpeted floor, some draped surfaces, and typical soft furniture.
2. "Average" surface area (about 1100 ft<sup>2</sup>) such as would result from a 19 ft x 15 ft room with an 8 ft ceiling.

**How Amplifier Requirements Vary with Room Acoustics.** Room acoustics affect the amplifier power required to achieve a given sound pressure level. Rooms larger than the average room have a larger surface area and thus require more amplifier power. Smaller rooms require less power. Rooms with more sound absorption than our average room (with "dead" acoustics) require more amplifier power. Rooms with less absorption ("live" acoustics) require less power.

A really complete treatment of the effects noted above cannot be given here. However, some examples will be useful in providing general guidelines:

1. A 10 ft x 20 ft x 30 ft "large" room with average absorption will require approximately twice the amplifier power as the average room.
2. A "medium-live" (average absorption coefficient = .1) room with the same dimensions as the average room will require approximately 40% less amplifier power.
3. A "medium-dead" room (average absorption coefficient = .25) with the same dimensions as the average room will require approximately twice the amplifier power.

### THE "POWER SENTINEL" FEATURE (type 35i Only)

Every loudspeaker system has certain eventual limitations imposed by the very nature of a carefully considered and rational design approach. These limitations need not be of concern most of the time but there are occasions where "letting her rip" will approach a point of endurance beyond which caution should be exercised. The recent developments in direct-cut, dbx recording and the upcoming true digital disk will make this endurance point more readily approachable.

Two LED indicators are used to indicate information about the endurance level of the type 35i system and when certain protective relays are being actuated.

An *amber* LED (to the left of the words "Power Sentinel") indicates, by intermittent flashing, that a system power is being *approached* that is beginning to tax the system to the fullest. This indication is usually associated with substantial low-frequency or midrange powers. Essentially constant glow of this LED indicates overload has been

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achieved. At this point a reduction in system input is called for. This may be done by reducing or eliminating any bass boost or loudness compensation being used on the amplifier or turning down the general loudness level.

The *red* LED (to the right of "Power Sentinel") indicates when a protective relay has been actuated to help protect the midrange and tweeter drivers by automatically reducing input to them. Any glowing of this LED calls for a reduction in system input. The relay will reset itself automatically and extinguish the LED when system input is sufficiently reduced. Since this relay is operative on the more easily damaged midrange and tweeter drivers, it can glow on certain types of program material that do not necessarily cause the other LED to glow.

Remember — *flashing amber implies caution and essentially constant amber and red, or in some instances, red alone suggests that the ultimate endurance level of the system is being exceeded, calling for a reduction in input levels.*

### ADDITIONAL SPEAKER PROTECTION AT HIGH LISTENING LEVELS

Some background: average power levels are usually 10 to 20 dB lower than program peaks of a few milliseconds duration. These peaks are basically harmless but are necessary for truly high quality reproduction. As the volume is turned up, program peaks will eventually be "clipped" or "flat-topped" as the amplifier runs out of power capacity, even though the average power level poses no problem for the amplifier. While moderate clipping of program peaks is inaudible on most types of program material, such clipping eventually produces a rough, raucous sound quality.<sup>8</sup> This quality is often mistaken for "speaker distortion" when in fact the speaker system is only faithfully reproducing a distorted signal, rich in high-frequency distortion components and of high average level.

Audible peak clipping, then, is your evidence that average power levels are rising and may be only 3 to 6 dB below maximum amplifier output. For a 200-watt amplifier, this means that average levels from 50 to 100 watts are being produced, which would almost certainly damage the usual speaker system. If the listener can tolerate highly audible distortion, even amplifiers of more modest capabilities can produce high long-term average outputs.

### Protection Limitations

If you choose to employ the following recommendation, keep in mind that any speaker protection system is a trade-off between two extremes: guaranteed protection and high listening levels. We feel that our recommendations do not excessively limit listening levels, yet provide a very reasonable assurance of additional protection. As a result, however, there are conceivably some program materials that fail to actuate any available protection devices yet result in speaker damage. Our experience indicates that such damage should be rare.

### Fusing for Protection

Fusing should rarely be required. However, when the possibility of carelessness or inexperience is combined with high listening levels and large power amplifiers (say, in excess of 60 watts per channel) it is wise to fuse each speaker system. This will prevent inadvertent damage to system low-frequency components.

A Littelfuse brand 3AG "Slo-Blo" fuse of 1½ ampere rating is recommended for each type 35 and type 35i speaker system. This particular fuse has been found to have a good current-versus-time characteristic, allowing higher (yet satisfactorily limited) current for relatively short periods of time and increased protection for more extended periods. Note that other brands of slow-blow fuses and standard-blow fuses can provide inappropriate protection for short time periods and are therefore not recommended).

It should be noted that, although the suggested fuse is rated at 1½ ampere, its characteristics are such as to permit system inputs of about 50 watts for approximately one minute and 150 watts for several seconds before blowing.

A fuse should be inserted in one of the speaker leads feeding each system. Inline fuse sockets may be used, or a fuse block may be glued to the rear of each enclosure. Both types of holders are readily available.

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## SPECIFICATIONS

The most valuable tool we have to assess our pursuit of accuracy is our ears. We listen to music, live and recorded, and we try to make our speakers *sound like music*. But our listening-based pursuit of accuracy is very much aided by a host of objective measurements. While even a complete set of measurements cannot predict how a speaker will sound, such measurements are immensely helpful in explaining why a speaker sounds as it does, so we can do something about it if necessary.

With this background, we present to you the following specifications summary. A truly complete set of measurements and appropriate commentary is not possible here; some measurements would have to be presented in graphical form to be most meaningful. Nonetheless, you will find these specifications an indication of our commitment to accurate reproduction as well as useful shorthand guide to what performance you may expect in your listening room.

### CD SERIES TYPE 35 and TYPE 35i SPECIFICATIONS

<b>Axial Frequency Response Under Anechoic, Half-Space Environment:</b>	Essentially flat from 40-30,000 Hz
<b>Total Acoustic Power Output vs. Frequency, Anechoic Environment:</b>	Essentially flat from 40-12,000 Hz
<b>Dispersion Angle or Acoustic Coverage Zone:</b>	Held to 100° by selection of woofer size and crossover frequency and "direktor" geometry 500-12,000 Hz
<b>Sound Pressure Level at 1 Meter, 1 Watt into Nominal Impedance, 300-10,000 Hz Average, Anechoic Environment:</b>	92 dB
<b>Suggested Amplifier Power Ratings, Continuous Average Power-per-Channel at 6 to 8 ohms impedance, assuming the avoidance of clipping,</b>	<b>Minimum:</b> 3 watts <b>Typical:</b> 10-50 watts <b>Maximum:</b> 400 watts
<b>Time Coherency:</b>	Main returns from woofer, midrange and tweeter synchronized to be within .15 ms on system axis
<b>Half-Space Reference Efficiency:</b>	1.4%
<b>Crossover Frequencies:</b>	1500 and 8000 Hz
<b>Impedance,</b>	<b>Nominal:</b> 6 ohms <b>Minimum:</b> 5 ohms
<b>Transducer Complement:</b>	30.0 cm (12 in.) dynamic woofer 3.8 cm (1.5 in.) midrange with direktor 2.5 cm (1 in.) tweeter with direktor
<b>Dimensions:</b>	54.1 cm (21.3 in.) wide 82.0 cm (32.3 in.) high 26.7 cm (10.5 in.) deep
<b>Cabinet,</b>	<b>Type 35:</b> Oak veneer <b>Type 35i:</b> Walnut veneer
<b>Net Weight,</b>	<b>Type 35:</b> 29 kg (64 lbs) <b>Type 35i:</b> 30 kg (66 lbs)

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## CUSTOMER SERVICE

### Shipping Damage

Electro-Voice products are packed to provide protection well in excess of the shipping requirements of the Interstate Commerce Commission. Responsibility for delivery in good condition was accepted by the carrier, and therefore any damage claims must be made by the receiver against the carrier. If shipping damage has occurred, contact the carrier immediately, requesting inspection and instructions: or contact the dealer from whom the unit was purchased.

### Reshipment

We strongly encourage you to retain all packaging materials for possible future use. Only original packaging materials are certain to provide full protection, whether used for units requiring service or simply for normal household moving. Bear in mind that a carrier can refuse a damage claim if *they judge* substitute packaging to be inadequate.

When necessary, Electro-Voice can supply replacement packaging for a nominal charge. Contact the Service Department.

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### WARRANTY (Limited)

CD series type 35 and type 35i are guaranteed against malfunction due to defects in workmanship and materials. If such malfunction occurs CD series type 35 and type 35i will be repaired or replaced (at our option) as follows:

Speaker systems will be repaired or replaced without charge for parts or labor for a period of five years from date of original purchase.

All units must be delivered prepaid to the proper Electro-Voice service facility and 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 instructions on return of Electro-Voice products for repair to the factory or authorized service agencies, please write: Service Department, Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan, 49107 (Phone 616/695-6831) or 8234 Doe Avenue, P.O. Box 3297, Visalia, California 93277 (Phone 209/625-1330,-1).

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

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  7. For a good introduction to the frequency distribution of various program materials: L. Feldman, "Mystery of the Failing Tweeters," *Radio-Electronics*, October, 1976.
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Electro-Voice engineering continually improves existing products, as well as creating new ones. Thus specifications given in this brochure are subject to change without notice.