

Rectilinear X1b

Time Delay Distortion

It is becoming increasingly apparent that phase response (phase angle plotted against frequency) is a more significant criterion of speaker performance than what is ordinarily called frequency response (pressure amplitude plotted against frequency). Between two reasonably advanced speaker systems, the one with the better amplitude response is not necessarily the one that sounds better (i.e., more natural or lifelike). But the one with the better phase response will be almost invariably preferred by the critical listener.

Superior phase response is dependent on low time delay distortion. Time delay distortion occurs when a speaker does not produce an acoustical output the instant an electrical input is applied to it. There is a measurable split second of delay between input and output. The delay is nearly always frequency-dependent, being greater at low frequencies as a result of higher inertial mass. The consequent disturbance of phase relationships is now suspected to be the chief cause of "canned," unnatural speaker sound.

All speakers produce some time delay distortion, but the Rectilinear X1b is superior in this respect to any other two-way system. The tight acoustic coupling of the woofer, the simplicity of the filter network and the unusually low mass of the tweeter all contribute to outstandingly low time delay figures throughout the frequency range.

SUMMARY OF SPECIFICATIONS:

Size: 23" x 12" x 10" deep
(584mm x 305mm x 254mm)

Drivers: 10" woofer, 3½" tweeter

Filter Frequency: 2000 Hz

Nominal Impedance: 8 ohms

Minimum Power Requirements: 10 watts RMS

Maximum Power Handling Capabilities:
50 watts RMS

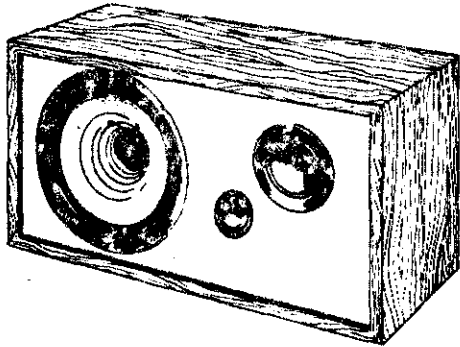
Frequency Response: 45 Hz to 18,500 Hz
± 2 dB

Controls: Treble adjustment

Connection to Amplifier: Binding posts

Cabinet: Vinyl walnut

Shipping Weight: 32 lb. (14.10 kg)



MINI-III

SUMMARY OF SPECIFICATIONS:

Size: 12" x 19" x 9½" deep
(305mm x 483mm x 241mm)

Drivers: 8" woofer (acoustic suspension),
5" midrange, 2" tweeter

Crossover Frequencies: 400 Hz and 8000 Hz

Nominal Impedance: 4 ohms

Minimum Power Requirements: 20 watts RMS

Maximum Power Handling Capacity:
75 watts RMS

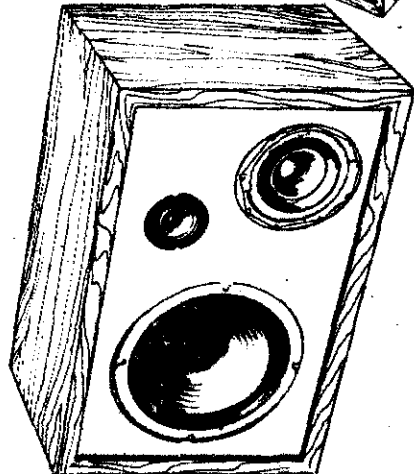
Frequency Response: 50 Hz to 18,500 Hz
± 4 dB

Controls: Separate midrange and
treble adjustments

Connection to Amplifier: Binding posts

Cabinet: Airtight one-piece construction
with vinyl walnut finish

Shipping Weight: 27 lb. (12.15 kg)



Rectilinear XII

preferred by the critical listener.

Superior phase response is dependent on low time delay distortion. Time delay distortion occurs when a speaker does not produce an acoustical output the instant an electrical input is applied to it. There is a measurable split second of delay between input and output. The delay is nearly always frequency-dependent, being greater at low frequencies as a result of the higher inertial masses involved. The consequent lag between drivers creates a disturbance of phase relationships that is now suspected to be the chief cause of "canned," unnatural speaker sound.

All speaker systems produce some time delay distortion, but the Rectilinear XII is superior in this respect to any other bookshelf speaker except the considerably more expensive Rectilinear 5. The tight acoustic coupling of the woofer in the Rectilinear XII, the low crossover to the considerably "faster" low-inertia midrange driver, the unusually low mass of the tweeter and the sophisticated crossover network all contribute to the lowest possible time delay figures throughout the frequency range.

SUMMARY OF SPECIFICATIONS:

Size: 25" x 14" x 10¾" deep
(635mm x 358mm x 273mm)

Drivers: 10" woofer, 5" midrange,
2½" tweeter

Crossover Frequencies: 350 Hz and 4000 Hz

Nominal Impedance: 8 Ohms

Minimum Power Requirements: 10 watts RMS

Maximum Power Handling Capacity:
50 watts RMS

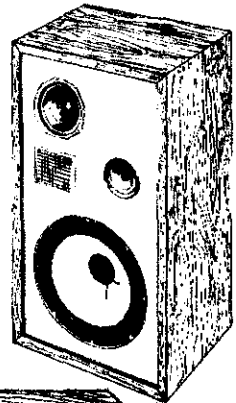
Frequency Response: 45 Hz to 18,500 Hz
± 2 dB

Controls: Separate midrange and
treble adjustments

Connection to Amplifier: Binding posts

Cabinet: One piece construction with
walnut finish

Shipping Weight: 42 lbs. (19.05 kg)



Woofer

A heavy-duty woofer of unusual capabilities was designed especially for this speaker system. Its diameter is 12 inches, a size considered by Rectilinear engineers to be greatly preferable to 15 or 18 inches even in the largest systems. A 12-inch unit has inherently faster transient response than larger woofers and can be designed to move sufficient air for solid fundamental output down to 20 Hz in the proper enclosure. The woofer of the Rectilinear IIIa accomplishes this by means of a foam surround that permits one-inch cone excursions without running into nonlinearity.

The operating range of the woofer is from 20 to 400 Hz, above which its response is rolled off at the rate of 6 dB per octave to keep it out of the sensitive part of the midrange where coloration could become apparent.

Voice coil diameter of the woofer is 2 inches; total magnet weight is 7½ lbs.

Rectilinear® IIIa

Midrange Driver

This is a 5-inch unit with an aluminum dust cap. The entire unit is sealed in its own critically damped chamber to prevent interaction from the back wave of the woofer. Transient response is exceptional throughout the driver's operating range.

Below 400 Hz, the filter network of the Rectilinear IIIa filters the response of the midrange driver at the rate of 12 dB per octave. This leaves three important octaves to be covered by this unit, in the range containing most of the specific frequency characteristics that differentiate the various musical instruments and voices. Thus the exceptionally smooth and neutral character of the speaker system's response is in large measure attributable to its midrange design.

No crossover elements are used in the trailing edge of the midrange as the unit rolls off smoothly by itself at 8000 Hz.

Voice coil diameter of the midrange driver is 1 in.; total magnet weight is ¾ lb.

Tweeters

Two 2½-inch units and two 2-inch units cover the range from 5000 Hz up. The slightly larger tweeters contribute more to the response up to 11,000 Hz; the smaller tweeters contribute more above 11,000 Hz. Thus there exists a virtual acoustic crossover at 11,000 Hz, even though all four drivers are connected together in series-parallel.

The tweeters are of classically simple design, with extremely light cone and voice coil structures, and they surpass in smoothness, transient response and dispersion characteristics all other moving-coil tweeters thus far tested by Rectilinear engineers, regardless of cost or complexity.

Voice coil diameter is ½ in. and total magnet weight is 1 oz. in both types.

Filter Network

Feeding the proper frequencies in correct proportion to the six different drivers of the Rectilinear IIIa requires a network of considerable sophistication. Rectilinear considers air-core coils in crossover networks to be not only unwieldy but actually obsolete; in the Rectilinear IIIa only air-gapped iron-core chokes are used, which, contrary to popular superstition about solid-core inductive devices, do not introduce the slightest distortion. Their precisely controlled tolerances permit filter points of great accuracy and repeatability, further assured by capacitive elements of the highest quality.

Cabinet

The outside dimensions of the Rectilinear IIIa cabinet are 35" by 18" by 12" deep. It is of ex-

remely rigid construction, in ¾" stock, with internal bracing. All six drivers are solidly bonded to the front panel, eliminating all possibility of vibration. The midrange driver is separately encapsulated in its own nonresonant chamber to isolate it from the back radiation of the woofer. The tweeters are in widely separated positions chosen for the best possible radiation pattern. The finish is laminite walnut; the grill cloth is of polyester fiber, so that it may be cleaned with a damp cloth.

The enclosure is tuned to the woofer by means of tube venting, in what is probably the most refined application of the bass reflex principle. An optimally operating bass reflex enclosure is somewhat difficult to design but well worth the trouble, as it can extend the bottom range of the woofer by nearly an octave and at the same time increase its efficiency by

about 3 dB. The use of a tube instead of a simple opening helps keep the size of the enclosure within reasonable limits without any sacrifice in performance.

Impedance and Efficiency

The nominal impedance of the Rectilinear IIIa is 8 ohms. Despite the bass reflex cabinet, it is a medium-efficiency system requiring a fair amount of clean amplifier power. Amplifiers of less than 30 watts rms power capability per channel are not recommended, and in large rooms 50 or even 100 watts rms per channel may be preferred by critical listeners for the reproduction of heavy program material at high levels.

Dispersion

The unusual design of the midrange driver and the unorthodox spacing of the inherently nondirectional tweeters result in a superior sound radiation pattern up to the highest frequencies. Dispersion is so wide that the subtlest high-frequency transients are fully audible off axis.

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All speakers produce some time delay distortion, but the Rectilinear IIIa is superior in this respect to any other floor-standing speaker. The tight acoustic coupling of the woofer, the simplicity of the filter network and the unusually low mass of the tweeter all contribute to outstandingly low time delay figures throughout the frequency range.

SUMMARY OF SPECIFICATIONS

Size: 35" x 18" x 12" deep

(889mm x 457mm x 305mm)

Drivers: 12" woofer, 5" midrange

Two 2½" tweeters

Two 2" tweeters

Filter Frequencies: 400 Hz, 500 Hz and 11,000 Hz

Nominal Impedance: 8 ohms

Minimum Power Requirements: 30 watts RMS

Maximum Power Handling Capacity: 100 watts RMS

Frequency Response: 32 Hz to 18,500 Hz ± 2 dB

Fuse: AGC 2½ (standard fast blow)

Connection to Amplifier: Binding posts

Cabinet: Laminite walnut

Shipping Weight: 75 lbs. (34.02 kg)

