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CANTON ERGO 100 SPEAKER

Manufacturer's Specifications

System Type: Three-way, tower-style, vented box.

Drivers: Two 8¾-in. cone woofers, one 6⅜-in. cone midrange, and one 1-in. dome tweeter.

Frequency Range: 18 Hz to 30 kHz.

Sensitivity: 93.1 dB at 1 meter with 2.83 V rms applied.

Crossover Frequencies: 300 Hz and 3.5 kHz.

Impedance: 4 ohms nominal.

Power Handling: 180 watts.

Recommended Amplifier Power: Up to 250 watts per channel.

Dimensions: 11 in. W x 45⅜ in. H x 13¾ in. D (28 cm x 115 cm x 34.7 cm).

Weight: 79⅛ lbs. (36 kg) each.

Price: $3,500 per pair in walnut, oak, mahogany, or black or white ash veneer; $5,000 per pair in high-gloss black, white, or mahogany.

Company Address: 915 Washington Ave. South, Minneapolis, Minn. 55415.

For literature, circle No. 92

Canton was founded in 1973 in the village of Niederlauken in the Taunus Mountains of Germany, and now exports to more than 24 countries. The name is formed from the Latin word *cantare*, to sing, and the German word *ton*, sound. According to Steve Teachout, president of Canton's American operation, they prefer to be known as "a company that applies the laws of acoustics and physics competently, with known and proven methods and materials, rather than a company that develops new ways to move air."

The Ergo 100, next to the top of Canton's extensive range of home speakers, is a vented, three-way, direct-radiator system with two woofers operating in parallel. All drivers are made by Canton. The midrange and bass drivers have graphite-enriched polypropylene diaphragms. This material is said to provide high self-damping, which suppresses unwanted mechanical vibrations of the cone more effectively than conventional coated paper cones. The midrange driver is mounted in its own chamber and located above the tweeter. Canton feels that since the midrange reproduces the important human-voice range of music, it should be assigned the topmost position in the cabinet to correspond with the ear level of a seated listener. The system's metal-

The cabinet's rounded contours not only enhance the system's appearance but improve its sound by minimizing reflections.

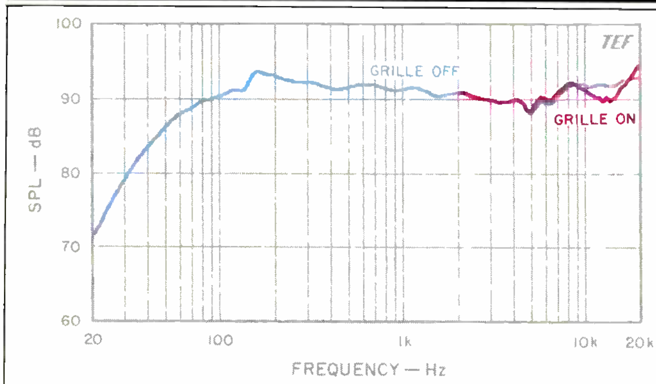

Fig. 1—One-meter, on-axis, anechoic frequency response, for an input of 2 watts into 4 ohms (2.83 V).

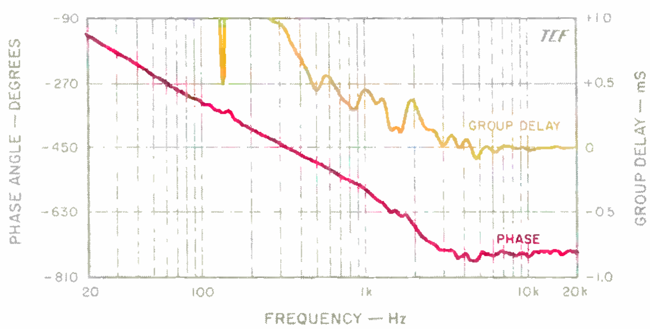

Fig. 2—On-axis phase response and group delay, corrected for tweeter arrival time.

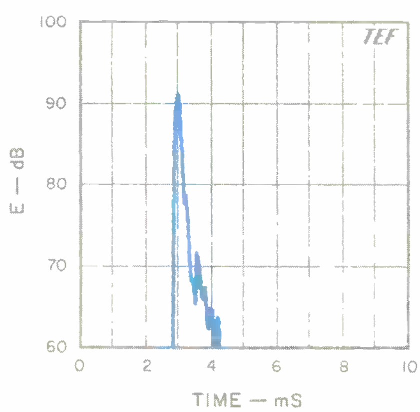

Fig. 3—One-meter, on-axis energy/time curve.

dome tweeter is made of aluminum and manganese with a soft fabric surround, and it has a diffuser lens to improve high-frequency coverage.

According to Canton, the crossover network has been optimized "especially with regard to phase lock reproduction and constant envelope delay times." This is said to guarantee that all frequencies in a musical selection actually reach the listener's ear at the same time.

The Ergo 100's cabinet incorporates a computer-optimized, bass-reflex (vented-box) configuration and has distinctly rounded contours that not only enhance the look of the systems but also improve sonics by minimizing reflections. All drivers are flush-mounted on the front panel, which is covered with a black sound-absorbing felt material. The grille is a self-supporting, perforated-metal assembly which fits into a groove. Connections are made through a pair of five-way binding posts at the bottom rear of the cabinet. Unfortunately, these posts are spaced apart by more than the standard ¾ inch, so they cannot accept normal double-banana plugs.

Measurements

Figure 1 shows the on-axis frequency response of the Ergo 100, with and without the grille. Measurements were taken with 2.83 V rms applied, at a distance of 2 meters on the tweeter's axis (about 36 inches above the bottom of the system) and then referenced back to 1 meter. Notable features include a relatively high sensitivity, a step in the response at about 150 Hz, and a modest lowering of level and slight response roughness in the crossover region from 2 to 7 kHz. The curve fits within a relatively tight window of +2.5, −3.0 dB from 60 Hz to 20 kHz. Below 60 Hz, the response rolls off gradually, attaining a roll-off rate of about 18 dB/octave below 30 Hz. Curves supplied by Canton were smoother through the region from 2 to 7 kHz, but those curves were measured at a height of 1.1 meters (43.3 inches), about even with the top of the enclosure, which is about 7 inches above the ears of a seated listener.

Averaging the curve over the range from 250 Hz to 4 kHz yields a sensitivity of about 91.5 dB, lower than rated. The lowering of level through the upper midrange region contributes to this. Below 10 kHz, the grille has only a slight effect on the response. From 10 to 16 kHz, the grille reduces the response but actually increases response above 16 kHz. Above 20 kHz (not shown), the response reached a maximum at about 21 kHz and then fell rapidly at higher frequencies. Comparing right and left units revealed a fairly close match of ±0.5 dB.

Figure 2 shows the phase and group-delay responses referenced to the tweeter's arrival time. The midrange lags the tweeter by about 0.4 mS, about 1.4 wavelengths at the 3.5-kHz crossover. This delay is partly due to electrical delays inherent in the crossover filter and partly to physical driver offsets. One significant feature of the curves is an anomaly at 150 Hz, which coincides with the step in the amplitude response.

Figure 3 shows the energy/time response of the system at 1 meter on axis for an input of 2.83 V rms. The test brackets the midrange's upper response and the tweeter's response below 10 kHz. The main arrival, at 3 mS, is quite compact, The vertical off-axis and on-axis curves are the same shape, showing that horizontal coverage is quite good.

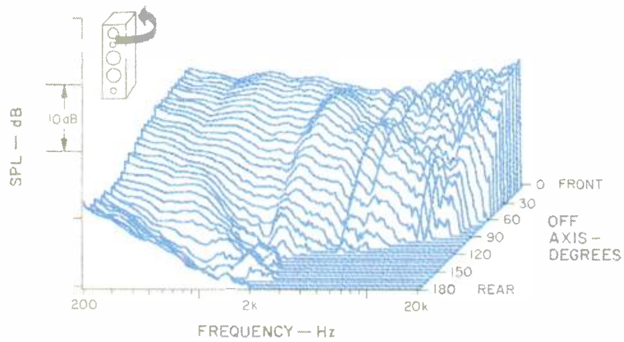

Fig. 4—Horizontal off-axis frequency responses, taken from the front, around the side, and to the rear of the speaker.

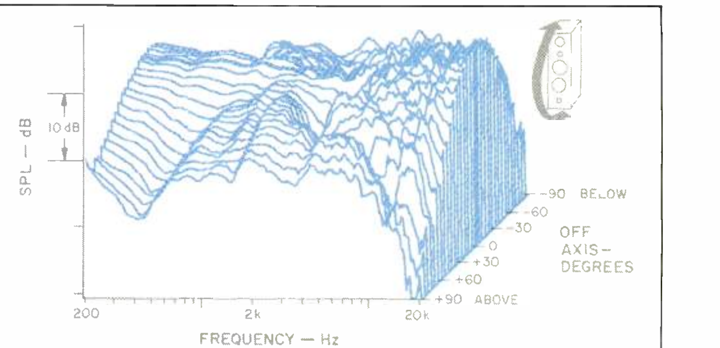

Fig. 5—Vertical off-axis frequency responses, taken from below, up the front, and to the top of the speaker.

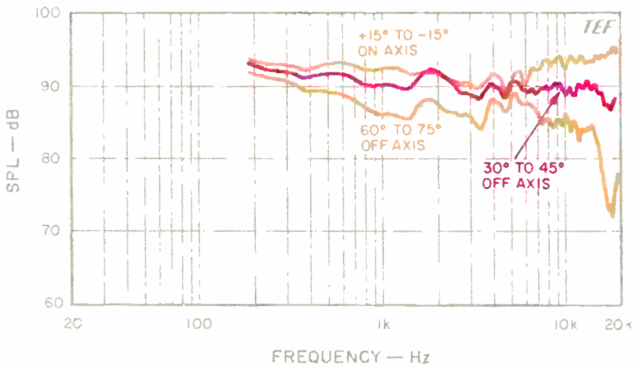

Fig. 6—Mean horizontal responses derived from data of Fig. 4.

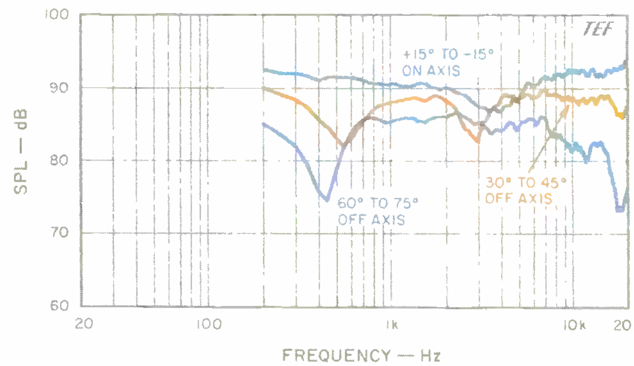

Fig. 7—Mean vertical responses derived from data of Fig. 5.

but the curve exhibits lower level arrivals 0.5 mS after the main peak.

The horizontal "3-D" off-axis curves are shown in Fig. 4; the on-axis curve is seen at the rear of the graph. The off-axis curves, in general, are the same shape as the on-axis curve, which shows that the horizontal coverage of the Ergo 100 is quite good and holds up well to beyond 15 kHz for angles out to ±45°.

The vertical off-axis curves are shown in Fig. 5. The on-axis response curve is shown in bold, halfway back, with the above-axis responses in the front of the display. The Ergo 100 exhibits narrowing vertical coverage at both the lower (300-Hz) and upper (3.5-kHz) crossover frequencies. Not seen clearly in the graph is the fairly symmetrical up/down response behavior through the 3.5-kHz region, which indicates only slight lobing. In the main vertical listening window of 0° to +15°, the response is quite uniform over the whole frequency range.

The NRC-style mean horizontal and vertical on- and off-axis response curves are shown in Figs. 6 and 7. The +15° to −15° horizontal curve (Fig. 6) is quite similar to the on-axis response, which indicates very good coverage in the primary listening range. The 30° to 45° response is quite close to the axial curve but with reduced level above 6 kHz. The lack of roll-off above 10 kHz is noteworthy. The 60° to 75° off-axis response exhibits no major anomalies and stays strong out to about 14 kHz. These curves signify a system that should image well in the lateral plane.

Figure 7 shows the mean vertical responses. The on-axis curve is very similar to the corresponding horizontal curve but exhibits a depression in the 3.5-kHz region caused by increased directivity due to the fairly high crossover frequency. Examination of the individual curves that make up the ±15° curve shows a fairly even up/down behavior that indicates minimal lobing. (The midrange and tweeter are mostly in phase through crossover, a desirable trait.)

Harmonic distortion at 440 Hz was no more than 0.7% at 100 watts—so low that I didn't even bother showing it.

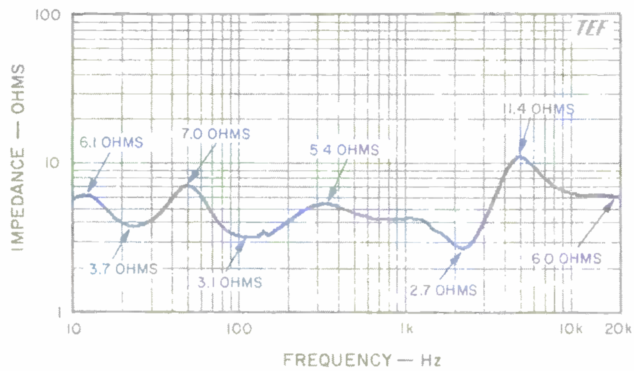

Fig. 8—Impedance.

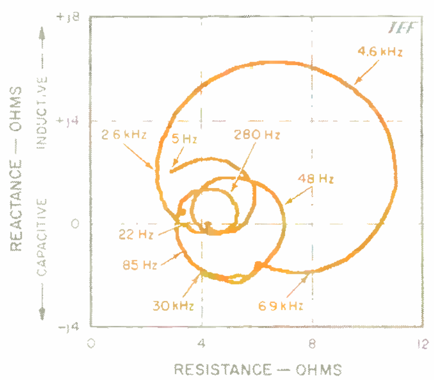

Fig. 9—Complex impedance, showing reactance and resistance vs. frequency.

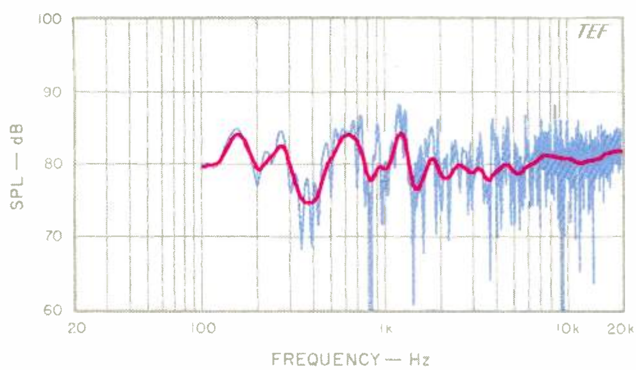

Fig. 10—Three-meter room response, showing both raw and smoothed data.

The main feature of the 30° to 45° response is the reduced level in the crossover regions (dips at about 500 Hz and 3 kHz), which indicates increased directivity in these areas. Except for a significant dip near the lower crossover, the 60° to 75° vertical response is quite close to the corresponding horizontal response. Also apparent in these curves is the lack of any severe treble roll-off below 16 kHz.

A high-level, low-frequency sine-wave sweep revealed one quite significant rear-panel resonance around 145 Hz, accompanied by some buzzing. This frequency coincided with the anomaly in the on-axis response noted earlier and also appeared later, in the system's measured impedance. Commendably, the woofer had no significant dynamic offset effects with the high-level sweep. The woofer's excursion exhibited no sharp reduction at the system's vented-box resonance frequency (roughly at 25 Hz). However, covering the port showed that the enclosure was providing a maximum reduction of woofer displacement of about 30% in the range from 24 to 30 Hz. In fact, the enclosure provided usable reduction in cone motion over a fairly broad range from 20 to 50 Hz. In this range, a significant portion of the total sound was radiated from the port. In the low-frequency range, with the port uncovered, the sound exhibited significantly less audible distortion than with the port covered. Some port air-rush noise was evident at higher levels, however. The port itself is a tube 6 inches long, with an inner diameter of 2¾ inches.

An examination of the port revealed that its inside end was covered with a thin piece of acoustic foam (stretched and glued tightly), which apparently provides deliberate resistance to the flow of air through the port. This changes the vented-box enclosure into a damped vented-box system, which has some of the advantages of both closed and vented systems. With damping, the vent's output covers a broader frequency range, thus spreading the beneficial effects of the port. The downside is that the distortion-reduction capabilities of the vented system are significantly reduced by spreading its effects over a broader frequency range. (This is covered more fully in my review of the Dynaudio Special One in the December 1990 issue.)

The enclosure is a tight-fitting, well-constructed cabinet whose medium-density fiberboard walls are unusually thick, a full inch. Two internal braces go completely around the inside of the cabinet, about one-third and two-thirds of the way down from the top of the enclosure. As the back-panel resonance showed, these braces apparently are not very effective in the range from 140 to 150 Hz. In a cabinet of this shape, theory suggests braces placed lengthwise on the panel would be more effective than crosswise braces; lengthwise braces raise the resonant frequencies much higher than crosswise braces do.

The sides of the enclosure are lined with fiberglass 2 inches thick, while an equal thickness of white batting-like material covers the rear. The upper portion of the cabinet is blocked off to form an enclosure for the midrange.

The woofer's linear excursion capability was a healthy 0.4 inch peak to peak, with a limit excursion of about 0.75 inch peak to peak (excellent values for an 8-inch woofer). The woofers overloaded gracefully at high levels. The nominal 8-inch woofer had an actual outside frame diameter of 8½

The Canton Ergo 100s' high sound output at 20 Hz, and even higher output above 40 Hz, may render subwoofers unnecessary.

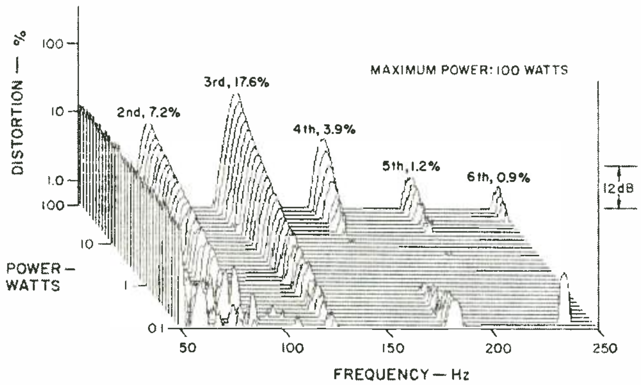

Fig. 11—Harmonic distortion products for the musical tone E_1 (41.2 Hz).

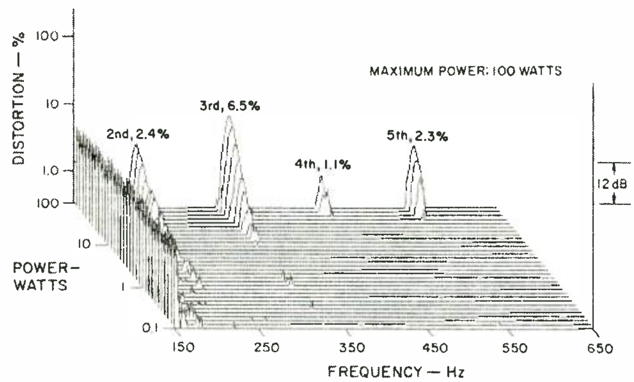

Fig. 12—Harmonic distortion products for the musical tone A_2 (110 Hz).

inches and an effective piston diameter, measured between surround middles, of about 6½ inches. Combined, the two 8-inch woofers have almost the same air-moving capability as a single 12-inch driver. The linear excursion capability of the midrange just about matched that of the woofers. The midrange driver would make a respectable bass driver for a two-way system. The effective piston diameter of the midrange was 4¼ inches, with an outside frame diameter of 6 inches.

The crossover of the Ergo 100 consists of 15 parts: Six inductors, six capacitors, and three resistors. Because two inductors are in series and two capacitors and two resistors are in parallel, the effective count is 12. Parts quality is very high, with 12-gauge wiring for the woofers and crossover drive and 14-gauge wire for the midrange and tweeter. All connections are soldered. The crossovers are on p.c. boards attached to the inside of the rear panel. The crossover is configured as a third-order low-pass filter for the woofers (one capacitor and two inductors), a fourth-order bandpass for the midrange (two capacitors, two inductors, and one resistor), and a second-order high-pass driving the tweeter (two capacitors, one inductor, and one resistor, including a series-RC impedance-correcting network).

Figure 8 shows the system's impedance plotted over the range from 10 Hz to 20 kHz. Three impedance minimums are seen, with the lowest being only 2.7 ohms at 2.2 kHz. The minimum at 25 Hz indicates the general range of the tuning of the vented low-frequency cabinet. A slight perturbation occurs at about 150 Hz, which coincides with the back-panel resonance. The Ergo 100 will be quite sensitive to cable voltage drop because of the system's relatively high maximum-to-minimum variation of 4.2 to 1 (11.4 to 2.7 ohms). Cable series resistance should therefore be kept low, limited to a maximum of about 0.040 ohm, to keep cable-drop effects from causing response peaks and dips greater than 0.1 dB. For a standard run of about 10 feet, 14-gauge or larger diameter wire is required.

The complex impedance from 5 Hz to 30 kHz is shown in Fig. 9. The phase angle of the impedance (not shown) reached a maximum of +54° (inductive) at the upper midrange frequency of 3.4 kHz and a minimum of −25° (capacitive) at the bass frequency of 71 Hz.

Figure 10 shows the 3-meter room response of the system with both raw and smoothed sixth-octave responses. The Ergo 100 was in the right-hand stereo position, aimed at the listening location, and the test mike was at ear height (36 inches), at the listener's position on the sofa. The system was driven with a swept sine-wave signal of 2.83 V rms (corresponding to 2 watts into the rated 4-ohm load). The response includes the direct sound plus 13 mS of the room's reverberation. Above 2 kHz, the smoothed curve is quite flat and well behaved and fits a tight window of ±1.8 dB. Excluding the 5-dB room dip at 400 Hz, the complete curve fits within a ±4 dB envelope from 100 Hz to 20 kHz.

Figures 11 and 12 show harmonic distortion versus power for the musical notes of E_1 (41.2 Hz) and A_2 (110 Hz). The A_4 (440-Hz) data is not shown because the distortion was quite low and did not exceed 0.7% at any harmonic at the 100-watt full-power level. The power levels were computed using the rated system impedance of 4 ohms.

Figure 11 shows the E_1 (41.2-Hz) harmonic distortion at power levels from 0.1 to 100 watts. At full power, the second and third harmonics reach moderate levels of 7.2% and 17.6%, respectively. The higher order harmonics are only significant above 10 watts. At 100 watts, the system generates a very loud 113 dB SPL at 1 meter at 41.2 Hz.

The A_2 (110-Hz) harmonic data is shown in Fig. 12. The third harmonic reaches only 6.5% at full power, with the second following behind at only 2.4% at 100 watts. The fourth and fifth harmonics are only significant above 50 watts. At 110 Hz, the system generates a very loud 121 dB SPL at 1 meter for 100 watts input.

Figure 13 shows the IM created when a 440-Hz (A_4) tone is mixed with a 41.2-Hz tone (E_1) of equal input level. At 50 watts, the IM distortion reaches only 4% and rises to 9% at

The Cantons' sensitivity was so high that my normal volume settings proved uncomfortably loud.

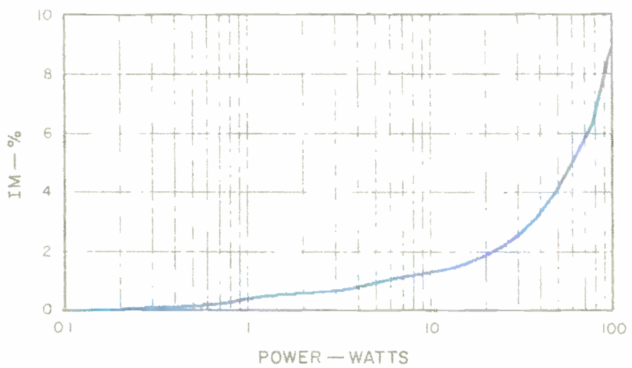

Fig. 13—IM distortion on 440 Hz (A_4) produced by 41.2 Hz (E_1) mixed in one-to-one proportion.

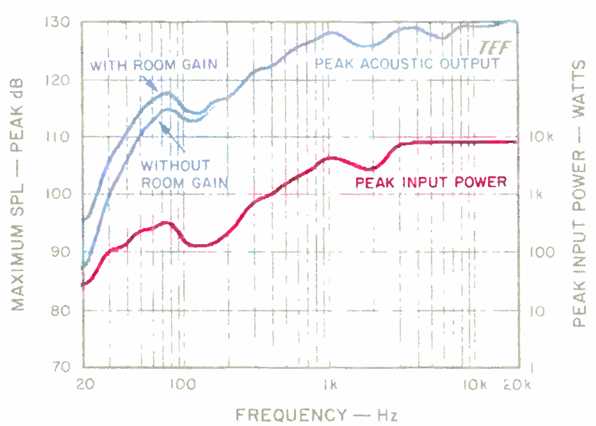

Fig. 14—Maximum peak sound output, measured at 1 meter on axis, and corresponding maximum peak input power levels.

100 watts. The relatively low IM is a result of the system's three-way configuration. The midrange mainly handles the upper frequency, while the woofer handles the lower.

Figure 14 shows short-term peak power input and output capabilities, as functions of frequency, measured with third-octave tone bursts. The peak input power (lower curve) was calculated by assuming that the measured peak voltage was applied across the rated 4-ohm impedance.

The peak input power rises with frequency, reaching about 300 watts at 80 Hz. Above this frequency, however, maximum power actually decreases to about 150 watts at 160 Hz and increases thereafter. The reduction in input power between 100 and 250 Hz was apparently due to inductor overload in the woofer's branch of the crossover, because the acoustic output waveshape turned into a triangle for higher power levels. The input power handling attains a level of about 9 kW (180 peak V across the rated 4-ohm load) at frequencies above 3 kHz. The slight dip in power handling between 1 and 3 kHz was caused by my test amplifier running out of gas, due to the Ergo 100's low impedance in this range.

The upper curve in Fig. 14 shows the maximum peak sound pressure levels the system can generate at 1 meter on axis for the input levels shown in the lower curve. Also shown is the "room gain" of a typical listening room at low frequencies, which adds about 3 dB to the response at 80 Hz and 9 dB at 20 Hz. A pair of the Canton systems in a standard stereo setup, operating with common-channel bass, will be able to generate higher bass levels. The peak acoustic output rises quite rapidly with frequency up to 80 Hz, where a maximum of about 114 dB is reached. After a moderate decrease, the output level continues to increase and attains levels in the range from 125 to 129 dB SPL above 3 kHz. The system's high efficiency and its high power handling above 600 Hz yield very high maximum output capabilities in this range. With room gain, the Ergo 100 exceeds 110 dB SPL above 40 Hz and generates very usable levels, exceeding 97 dB at 20 Hz and above. Subwoofers may not be required with this system!

Use and Listening Tests

Canton provides a well-written, 14-page instruction manual—not nearly as long as it sounds, because half of it is in German and five pages are devoted to the specifications of the Ergo line. The "Power Handling" section cautions you not to turn the volume up higher than is good for the speakers, adding that you can judge this by audible distortion as overload begins. But it also warns that this assumes sober listeners: "Alcohol raises the tolerance threshold for distortion. Many a loudspeaker has met its doom at a party where the wine was flowing freely."

The Ergo 100s are quite attractive. My review samples were finished in a very handsome oak veneer, and workmanship was first-class. The rounded upper corners helped the systems blend in with other furnishings.

The speaker terminals at the bottom rear of the cabinet are designed for finger-tightening only and not for a nut driver. As the terminal access space is somewhat small, I frequently felt I was not getting the terminals tight enough.

The speakers were placed about 10 feet from my sofa, about 6 feet from the short rear wall and 4 feet from the side walls, and they were spaced 8 feet apart. The systems were auditioned with their grilles off and were canted in towards the listening position. Most listening was done before the measurements.

My first experience with the Ergo 100s made me quite aware of their high sensitivity; normal volume settings on the Rowland Consummate preamp resulted in uncomfortably loud levels! I fired up the systems on the latest *Mannheim Steamroller Christmas* CD (American Gramaphone AGCD-1984) and was pleasantly surprised with the balanced, wide-range performance. Wind chimes, between the "Deck the Halls" and "We Three Kings" tracks, sounded extremely

Chamber music showed off the 100s' excellent imaging, with instrument placements that were quite vivid and distinct.

lifelike. The systems were well balanced but exhibited some upper bass fullness and did not quite have the low-frequency extension of my reference B & W 801s. The low end, however, was quite tight and well controlled.

The high sensitivity of the 100s serves well when reproducing the high peak levels of the special-effects sounds on *Ein Straussfest* (Telarc CD-80098). When this disc is played at high levels, the sounds of cork-popping and weaponry at the ends of cuts 3 and 4 will nail your head to the wall! The systems were also capable of creating clean, quite realistic levels on the marching band in the Boston Pops/John Williams *I Love a Parade* (Sony Classical SK 46747).

The Canton systems passed the pink-noise stand-up/sit-down test with only minimal changes in upper midrange tonality. The horizontal coverage equalled that of my reference speakers. On pink noise, some slight spectral unevenness and tonality were evident on the 100s when compared to my references. (My reference systems are very good in this regard, it must be pointed out.) Random noise, including pink noise, should sound quite bland and featureless; any discernible tonal characteristics would indicate that one frequency band was being emphasized over another.

On low-frequency, third-octave band-limited pink noise, the Canton systems credibly handled all the bands from 20 Hz up. At 40 Hz and above, the Ergo 100s were the equal of my reference systems. At the three lowest bands (20, 25, and 31.5 Hz), the fundamental output was not as strong as my references' and had somewhat more port wind noises. For these comparisons, the level was set just slightly below the overload point for the 20- and 25-Hz bands.

On the new Dire Straits album *On Every Street* (Warner Bros. 9 26680-2), my reference speakers had a somewhat livelier, punchier bass than the Cantons but did not sound quite as well controlled. However, room acoustics and system placement bear heavily on performance in this frequency range. The Cantons' reproduction of upper frequency vocal sibilants was slightly crisper and a bit more emphasized than my references'.

The excellent imaging capabilities of the Ergo 100 were demonstrated on the string chamber music of Schubert's Quintet in C (Sony Classical SK 46669, played on all Stradivarius instruments from the Smithsonian), where lateral instrument placements were quite vivid and distinct. When the preamp was in the mono mode, the image was centered and quite stable, of minimal width, and did not wander with frequency. Close right/left system matching is required to maintain a stable center image under these conditions.

To sum up, the high sensitivity and good looks of the Canton Ergo 100s, combined with their smooth, balanced, wide-range sound—as well as good imaging and low distortion—make them very worthy contenders in the floorstanding tower loudspeaker competition. *D. B. Keele, Jr.*