Equipment Profiles

Sony/Superscope TC-277-4 Quadradial tape deck

MANUFACTURER'S SPECIFICATIONS

Tape Speeds: 7½, 3¾, and 1⅞ ips. **Controls**: Four-channel/two-channel switch; tape direction, rewind, pause, and brake; four independent record level controls; headphone channel switch; bias and equalization switch; line-mic input switch, and front-rear record switch. **Inputs**: Four mics, four line or auxiliary. **Features**: Automatic shut-off, sound-with-sound, vertical and horizontal operation, automatic tape lifters, and record interlock. **Frequency Response** (Sony SLH-180 tape): 50 to 18,000 Hz ±3 dB at 7½ ips. **Dimensions**: 15¾ in. W by 7¾ in. H by 15½ in. D. **Weight**: 23 lbs., 2 oz. **Price**: $339.95.

Quadraphonic tape recorders are not particularly cheap, partly because of the precision nature of the heads involved and partly because of the relatively low production—or so I would suppose. One exception is the new Sony-Superscope TC-277-4 which costs only $339.95, and it offers a very impressive specification at that. I have had one of these machines in use for more than three months now and can attest to its ease of operation and high performance standards—which, incidentally, would be considered good in a recorder costing almost twice as much. Naturally, it does not have all the refinements of the big Quadradial 854-4S, for example (Syncro-Trak, 15 ips, variable speed control, etc.), but it *does* have separate meters for each channel, three speeds, provision for headphone monitoring of front and/or rear channels, and, most important these days, switchable equalization for high efficiency tapes. Front or rear channels can be recorded separately—in other words, you can use the machine as a two-track recorder or for mono if you wish. Figure 1 shows the view underneath; the circuit board can be seen at the top right and the power transformer on the left. The input panel is located on the side and it can be seen in Fig. 2. Microphone input sockets—four of them—are located on the front panel just under the RECORD switches. Control functions can be seen from the photograph at the beginning of the review—the large knob on the right is the tape direction and rewind control. Fig. 3 shows the heads and capstan assembly.

Circuit Description

Figure 4 shows a block diagram of the basic circuit of one channel. The first stage uses a bootstrap arrangement to get a high impedance input ($R_{1, 2}$ and 3) in Fig. 5. The inductance L_1 is a bias trap. Four more transistors are used in the combined audio playback and record stages plus another for the meter. The erase oscillator uses two transistors in a push-pull circuit, and two more are employed in the stabilized power supply, making a grand total of 29, plus 11 diodes.

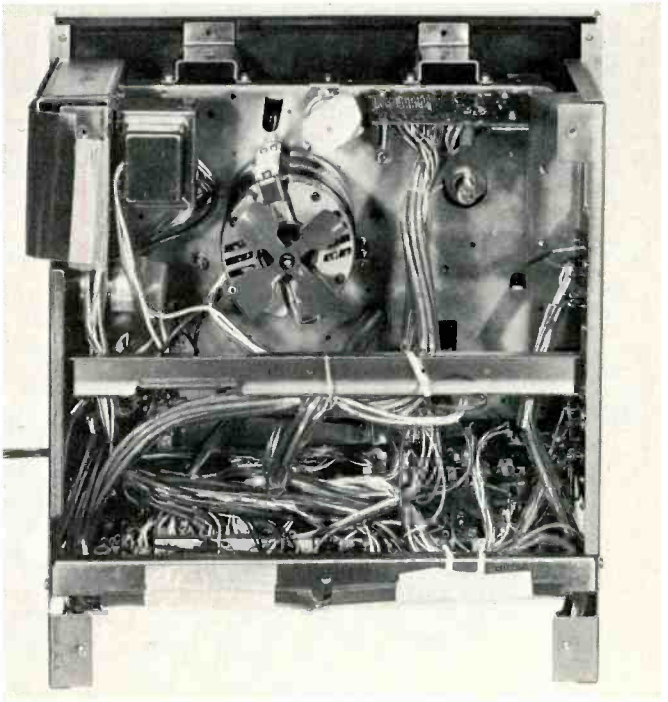

Fig. 1—View from beneath.

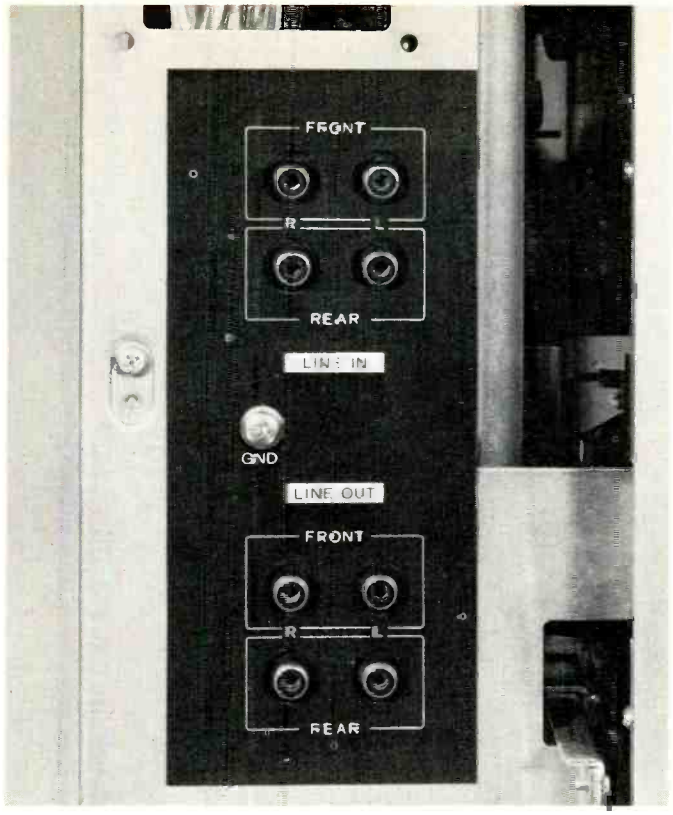

Fig. 2—Input panel.

Fig. 3—Heads and capstan assembly.

Measurements

Frequency response at the three speeds (record-replay) is shown in Fig. 6. The tape used was Sony SLH-180 as recommended. Figure 7 shows the response at 7½ ips using standard Ampex test tape. Signal/noise was –62 dB at 7½ ips, –58 dB at 3¾ ips, falling to –54 dB at 1⅞ ips, all measured at +3 dB level. Distortion was 0.58 per cent THD for 0 dB, increasing to 0.75 per cent at +3 dB (at 7½ ips), and crosstalk at 1 kHz was –58 dB, increasing to –52 dB at 10 kHz. Sensitivity at the tape input sockets was 42 mV for +3 dB recording level. Line output was 0.775 volts at 0 dB.

Wow and flutter measured 0.13 per cent at 7½ ips, 0.16 per cent at 3¾ ips, and 0.25 per cent at 1⅞ ips. Tape rewind speed clocked at 3 min., 10 sec. for an 1800-ft. reel.

During the tests, several ordinary tapes were checked with the bias control set to "normal" and although results were good, there was no doubt of the superiority of such high density tapes as the BASF LP 65, Maxell HD 35, TDK 150 SD, and the Sony SLH-180. The saturation point of high fre-

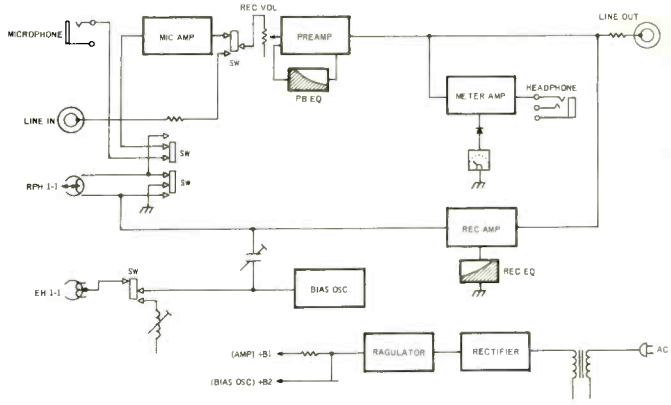

Fig. 4—Block diagram of the basic circuit, one channel.

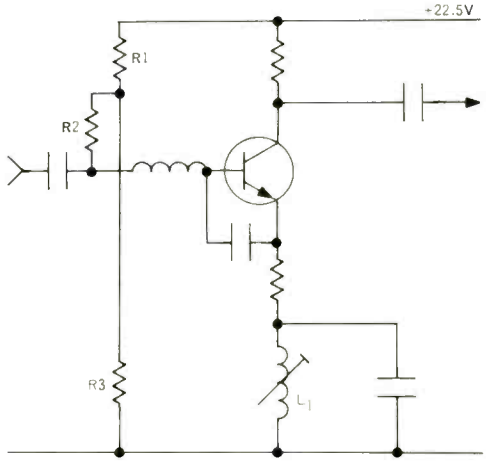

Fig. 5—Input stage.

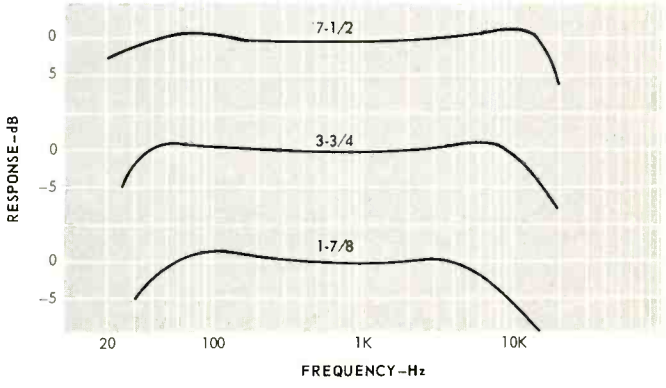

Fig. 6—Record-playback response at three speeds.

quencies is much higher, and there is an improvement in signal/noise of some 3 dB and the upper range is extended.

Mechanically, the TC-277-4 was quiet and well-behaved. I was particularly impressed with the tape direction control. The reels could be stopped without any fuss or overspill. Not only that, but the control was gentle enough to avoid the possibility of breaking tapes yet it was absolutely positive. Full marks to Superscope engineers. Electrically, the figures speak for themselves. It is sufficient to say that you would have to spend a great deal more money to get a significant improvement—especially at 7½ ips. It is true that there are not a great number of quadraphonic tapes available at the present time, but this situation should change quite soon. Home recording in four-channel will give a great deal of scope for the enthusiast—especially if he is interested in electronic music or drama. *T.A.*

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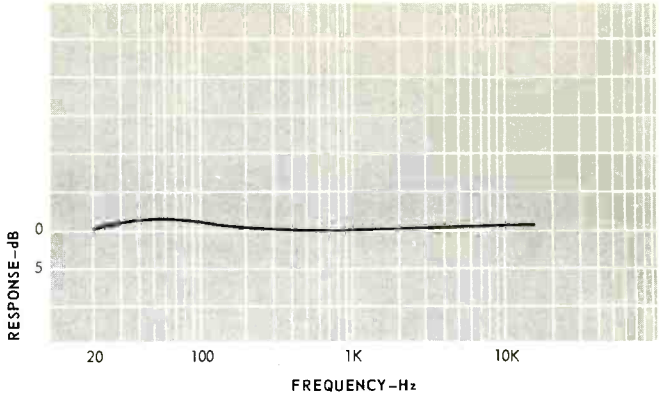
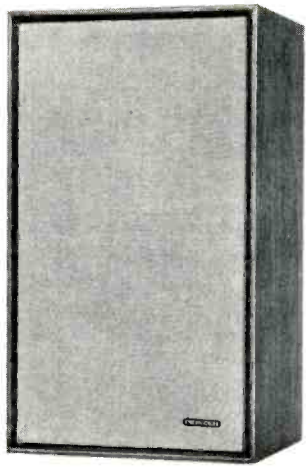


Fig. 7—Playback from standard tape at 7½ ips.



Pioneer CS-E400 Speaker System
MANUFACTURER'S SPECIFICATIONS

System Type: Two-way, air-suspension. **Speaker Components:** Two; woofer, 8-in. cone type; tweeter, 1-in. dome type. **Nominal Input Impedance:** 8 ohms. **Frequency Response:** 35 to 20,000 Hz. **Sensitivity:** 89 dB/W at one meter distance. **Maximum Input Power:** 30 watts. **Crossover Frequency:** 2,800 Hz. **Dimensions:** 20⅛ in. H by 11½ in. W by 7½ in. D. **Weight:** 23 lbs. **Price:** $79.95.

Here's a nifty small speaker system from Pioneer, a full-line audio component manufacturer noted primarily for its receivers and amplifiers. The Model CS-E400 is a handsomely finished and a versatile performer.

To begin with, the loudspeaker enclosure is walnut finished on all six sides, which includes the front surface, where the speaker units themselves are mounted behind the removable beige grille cloth panel. There's something very racy in seeing the woofer cone and wire-covered tweeter dome mounted on a finished walnut panel, but we doubt that many will want to leave the grille cloth off for very long periods. The input terminals are recessed into the rear of the enclosure, while the tweeter control is recessed into the front. With greater emphasis on the search for flatter frequency response in the listening room, as evidenced by the increased use of equalizers and the like, we think that most users will find the front-mounted speaker adjustment controls are more convenient to use than the more conventional rear-mounted ones, and we hail this up-front location in the Model CS-E400.

This bookshelf-size speaker from Pioneer has a well-made conventional 8-in. acoustic suspension woofer. The 1-in. dome-type tweeter is made of especially treated wool fibers, which, according to Pioneer, results in improved high end performance.

Measurements

Our standard set of tests at four feet revealed the Model CS-E400 to be a good performer overall. It has low harmonic distortion, the major portion of which occurs in the second harmonic, coupled with above average efficiency as its most significant attributes. The frequency response curve of Fig. 1A shows the unit to be within ±6 dB from 40 to 14,000 Hz on axis and not significantly different off axis, as shown in

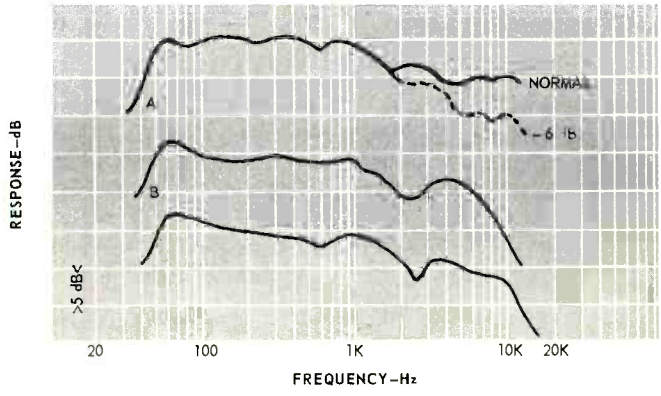


Fig. 1—Frequency response to ⅓-octave band pink noise. Curve A was measured from four feet, on axis. The upper treble-area curve is with "normal" tweeter setting; the lower with "−6 dB" setting. Curve B is response at 45° off-axis. Curve C is a composite of five curves, taken both on and off axis.

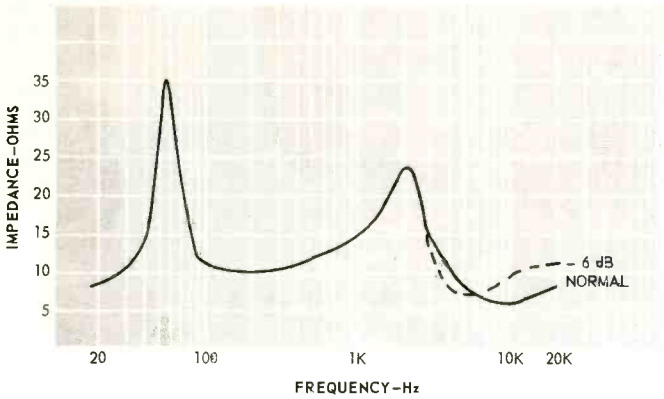


Fig. 2—Impedance throughout the frequency range, shown at two settings of the tweeter level control.

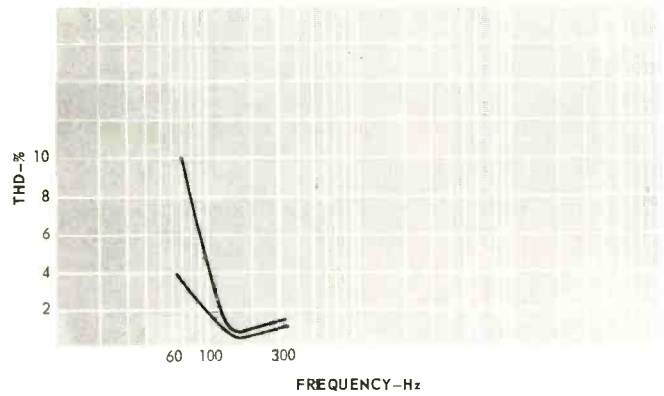
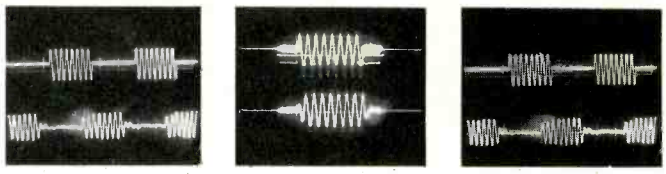


Fig. 3—Low frequency harmonic distortion at 95 and 100 dB SPL. Distortion is mainly of the second harmonic.



A B C

Fig. 4—Tone burst response at **A**, 100 Hz; **B**, 1000 Hz, and **C**, 10,000 Hz.

Fig. 1B. The averaged response curve, Fig. 1C, shows a small audible dip at 2,500 Hz, which is around the crossover point and smack in the middle of the "presence" region. The impedance curve of Fig. 2 shows this as a corresponding peak, as well as the speaker's bass resonance at 60 Hz. The highs are fairly extended and non-directional. The speaker begins to roll off sharply at 60 Hz, which is to be expected from such a small box with relatively high efficiency. Input of 1.5 volts produced an 85 dB sound pressure level out at four feet, which is indeed efficient compared to other acoustic suspension bookshelf designs. It means that an amplifier with 20 watts rms power per channel will do nicely in driving the speaker in an average room. Its transient response was excellent, as can be seen in the toneburst photos of Fig. 4.

Listening Tests

In listening tests, the speaker had a clean, open sound, without the usual presence peak associated. Optimum balance in our room was with treble control set to the "–6 dB" position. The dip in the presence region is to be preferred to the usual rise since most recorded material suffers from excess brightness in this part of the frequency spectrum. We recommend this speaker to the audiophile who must work within the confines of a limited budget. *Alex Rosner*

B&W 70 CA
Loudspeaker System

MANUFACTURER'S SPECIFICATIONS

System Type: Two way; 13-in. triple-suspension woofer in infinite baffle enclosure and 11-segment electrostatic midrange and treble unit. **Crossover**: 400 Hz, 18 dB per octave. **Frequency Response**: 25 to 18,000 Hz ±3 dB. **Nominal Impedance**: 8 ohms. **Recommended Amplifier Power**: 50 watts per channel, minimum. **Weight**: 80 lbs. **Dimensions**: 26 in. W by 32 in. H by 15 D. **Price**: $660.00

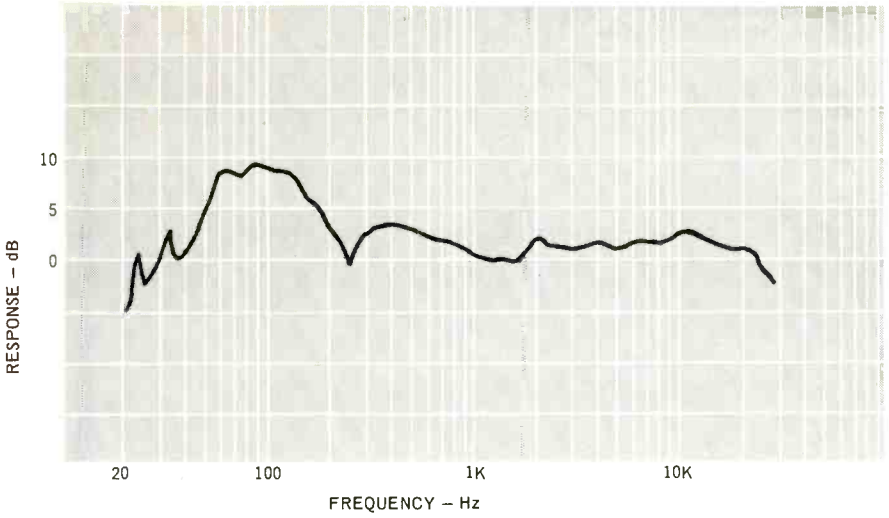


Fig. 1—Frequency response

The B&W 70CA is the American version of a British-made system that has been highly praised by European critics. It is a dynamic-electrostatic combination using a heavy 13-in. bass unit combined with a wide-angle electrostatic speaker. Its appearance is unusual as the electrostatic unit is not inside the enclosure but is placed on top where it is fixed by two plug-in metal dowels and mates to the energizer unit with a multi-pin plug using gold-plated pins. The external mounting not only avoids diffraction effects, but it allows rear radiation as well, allowing the unit to act as a true bi-polar radiator. The unit is 27 in. long by 6 in. high with an arc of 80 degrees. The polarizing supply and crossover components are housed in the main enclosure. Crossover point is 400 Hz and special ferrite inductors are used with 74 μF. paper capacitors. The bass speaker has a heavy laminated cone which is damped by synthetic rubber pads. The enclosure itself is sealed and filled with fiberglass and the complete system stands some 32 in. high, so the high frequency radiation is at ear level and is not obstructed by furniture. As the leaflet says, "There is a basic objection to the reproduction of soloists appearing some 12 to 18 inches above the floor." The cabinet is constructed of 1-in. veneered chipboard—which partially accounts for the net weight of 80 lbs and bespeaks quality throughout. The finishes available are oiled walnut with a dark brown metal stand or white lacquer with a black stand.

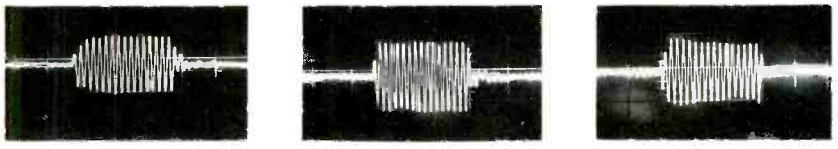


Fig. 2—Tone burst characteristics at **A**, 50; **B**, 1000, and **C**, 5,000 Hz.

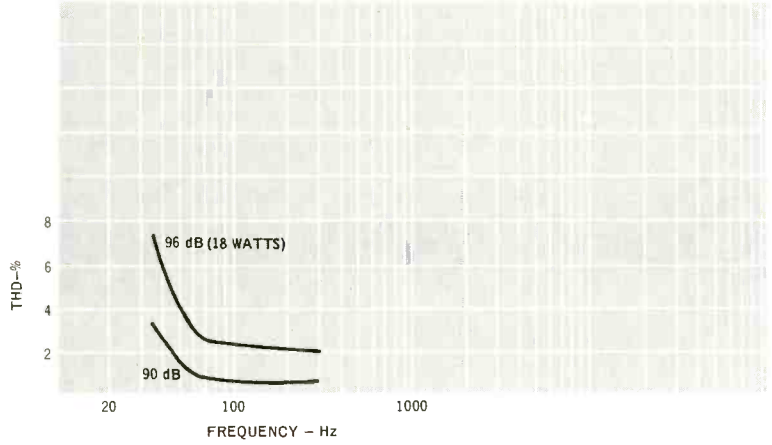


Fig. 3—THD at low frequencies.

Measurements

The first impression was of relatively low sensitivity and so the nominal 50-watt amplifier was changed for one giving a genuine 100 watts per channel. Second impression was the remarkably smooth white noise performance—easily one of the best I have yet heard from any system. Dispersion was outstanding and white noise tests show little variation over a 120° arc. Coloration at the low end was minimal and overall sound was excellent with a transparent quality particularly noticeable with choral groups and chamber music. The stereo image was excellent with a very wide listening area. Subsequent tests were made in a larger room (about 40 by 20 by 11 ft. high) and with a larger amplifier, a Phase Linear 700. Here it was more difficult to arrive at a good frequency balance. It is worth mentioning that this speaker, as with one or two other systems having an extended bass response, is somewhat sensitive to room acoustics and may set up standing waves. Placed in the corners the bass was still good but at high levels it tended to be overpowering with a trace of hangover. Some improvement was attained by bringing the speakers into the room away from the corners, but the most effective method was the use of an equalizer, actually a Soundcraftsmen 20-12. This was set to reduce frequencies in a broad band centering on 70 Hz. and then all was well. Next, measurements were taken in the lab and the frequency response, using one-third octave pink noise, is shown in Fig. 1. Figures were taken, as is our usual custom, up to 45 off-axis, plus an average of three additional curves, but in the case of the B&W 70CA, these did not differ significantly from the on-axis curves so are not shown. Figure 2 shows tone-burst characteristics at 50, 1000, and 5,000 Hz.

Bass response was well-maintained down to 32 Hz and doubling commenced at 70 Hz if driven hard. (The manufacturer, however, does not claim

that the 70CA is a theater type speaker capable of producing levels at or near the threshold of pain.) Figure 3 shows the distortion figures for the low frequencies at 90 and 96 dB power levels. The impedance showed a wide variation customary with electrostatic systems and is shown in Fig. 4. The lowest point was 2.7 ohms and the highest 53.7 ohms, but this should prove no problem with any self-respecting amplifier.

Further listening tests were made in other locations with the following conclusions; the B&W 70CA is unquestionably one of the best systems available at present, but it does need a lot of power (no big disadvantage these days). It is a speaker you should investigate if you are looking for high-quality no-compromise speaker system. *T.A.*

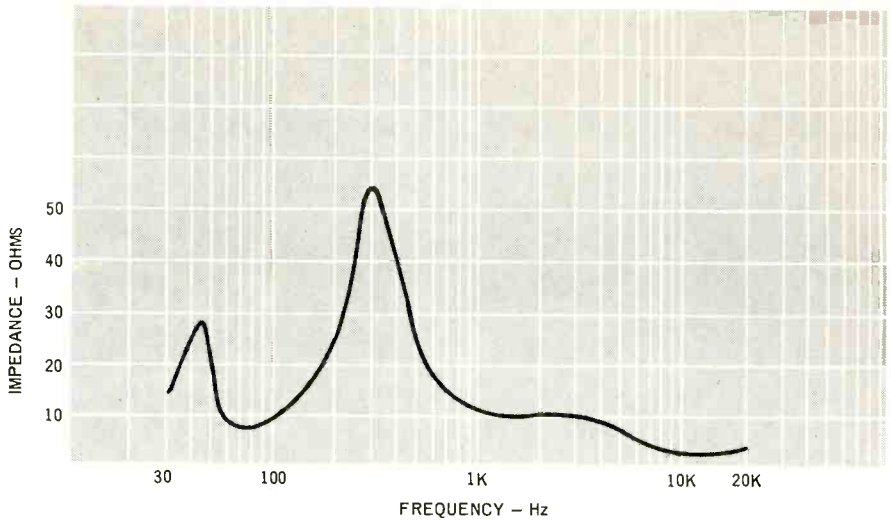


Fig. 4—Impedance characteristics.

Panasonic Model SA-5800

AM/FM Stereo Receiver

MANUFACTURER'S SPECIFICATIONS

AMPLIFIER SECTION. IHF Music Power: 75 watts at 8 ohms; 100 watts at 4 ohms. **RMS Power**: 27 watts/channel at 8 ohms; 37 watts/channel at 4 ohms. **THD**: 0.5%. **IM Distortion**: 0.7%. **Power Bandwidth**: 5 Hz to 40 kHz. **Frequency Response**: Phono, RIAA ±1 dB; Aux, 15 Hz to 65 kHz +0, –3 dB. **Input Sensitivity**: Phono, 2 mV; Aux and Tape Monitor, 180 mV. **S/N Ratio** (IHF, A): Phono, 70 dB; Aux, 90 dB. **Tone Control Range**: Bass, +13, –14 dB @ 50 Hz; Treble, ±10 dB @ 10 kHz. **Damping Factor**: 70 at 8 ohms.

FM TUNER SECTION. IHF Sensitivity: 1.8 μV. **THD** (Mono): 0.4%. **S/N Ratio**: 60 dB. **Selectivity**: 80 dB. **Spurious Response Rejection**: 75 dB. **I.f. Rejection**: 100 dB. **Image Rejection**: 90 dB. **AM Suppression**: 45 dB. **Capture Ratio**: 1.5 dB. **Stereo Separation** (1 kHz): 35 dB.

AM TUNER SECTION. IHF Sensitivity: 15 μV. **Selectivity**: 30 dB. **Image Rejection**: 65 dB. **I.f. Rejection**: 70 dB.

GENERAL SPECIFICATIONS. Dimensions: 16 in. W by 5½ in. H by 14 in. D. **Weight**: 24 lbs. **Retail Price**: $299.95.

Our first introduction to this excellent group of component receivers was in late 1971 when we reviewed Panasonic's then top-of-the-line Model SA-6500 (AUDIO, Nov. 1971). Embodying many of the same electronic features and "dress," the Panasonic Model SA-5800 is a moderate-power, moderately priced receiver with virtually all the control features of its bigger brother left intact. Referring to the photo of the front panel, which is made of heavy, extruded, light-gold anodized aluminum, you will note that rotary controls (as opposed to slide controls on the more expensive model) are used for BASS, TREBLE, BALANCE, and VOLUME. The SPEAKER selector switch, at the upper left of the panel, includes positions for MAIN, REMOTE, MAIN AND REMOTE or PHONES while a separate push-push POWER on-off switch at the lower left, next to the headphone jack, enables you to leave all other control settings where you like them when the set is turned off. The tone controls of the SA-5800, though set by rotary knobs, actually offer more control than the "slide controls" provided on the larger unit, since each control is really a pair of concentric knobs, permitting individual channel adjustment of both bass and treble. A pair of additional push-push switches activate the HIGH-CUT filter and the LOUDNESS circuits while four toggle switches take care of STEREO-MONO mode, FM MUTING, and *two* tape MONITOR settings. The program selector switch, at the lower right, has positions for PHONO, AUTO FM (Stereo), FM MONO, AM, and AUX. The massive tuning knob at the upper right of the panel—equipped with smooth flywheel action, tunes the illuminated dial pointer across a completely linear FM dial calibration scale. This linear dial scale feature has been commented on before, but it bears repeating. With today's crowded FM dial, it's nice to have as much "spread" between, say, 106 and 108 MHz as you have between 90 and 92 MHz. It makes tuning that much easier and, with Panasonic's accurate calibration, almost eliminates the need for the popular "zero to one hundred" logging scale. (Panasonic includes it anyway!) The pointer, by the way, increases its

"glow" when a station has been properly tuned in, but then, of course, there is a center-of-channel tuning meter at the left of the dial for those who wish more definitive assurance of accurate tuning. When the AM mode is selected, the tuning meter needle swings over to the left and becomes a signal-strength meter, thus providing the optimum metering function for each of the two radio services. A stereo indicator light, as well as lights which show program source, are arranged above the dial scales and the dial is fully blacked out when power is turned OFF.

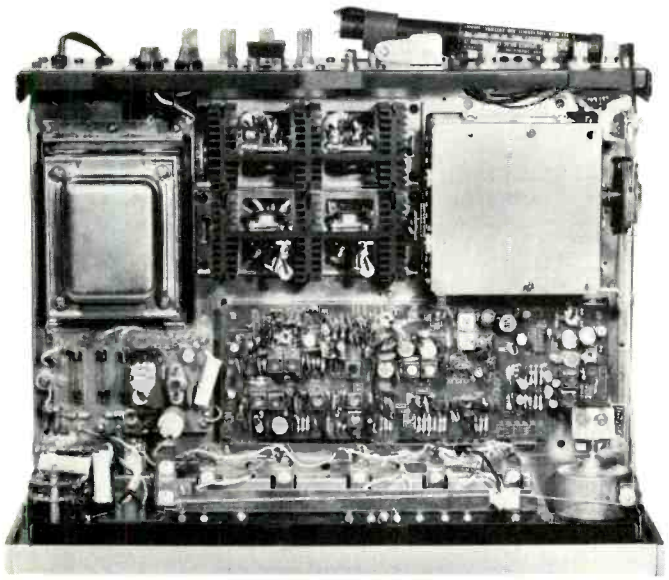


Fig. 1—Internal view.

The rear panel of the SA-5800, shown in Fig. 1, features balanced (300 ohm) and unbalanced (75 ohm) antenna terminals as well as a terminal for connection of an external AM antenna should the self-contained ferrite bar antenna prove inadequate in difficult AM reception areas. The usual input and record output jacks, practically short-proof main and remote speaker terminals, and a pair of convenience a.c. outlets (one switched and one unswitched) are sensibly arranged for easy access. In addition, there are a pair of speaker protection fuses, a center-channel output jack (requiring a power amplifier if it is to be used for a center-fill speaker system), and a pair of circuit jumpers which connect the preamp outputs to the power amplifier inputs. A DIN connector socket is wired in parallel with *one* of the tape monitor input and output jack pairs, for use with tape recorders equipped with this type of connector.

Fig. 2—Rear panel.

Figure 2 shows the internal chassis layout of this receiver. Construction is modular, employing a sealed front-end and a separate i.f. and multiplex p.c. board. The front-end employs two 4-pole MOS FET's and a specially constructed variable capacitor which is responsible for the linear FM dial previously described. A three-section tuning capacitor is used in the AM section. The i.f. section includes four differential amplifier stages and six elements of ceramic filters in addition to conventional L-C tuned circuits. The multiplex circuitry is built around a single multi-purpose IC.

The power amplifier circuitry is direct coupled to the loudspeaker terminals and is powered by positive and negative supply voltages. Layout of the unit is well planned, with adequate heat sinking provided for the power output transistors.

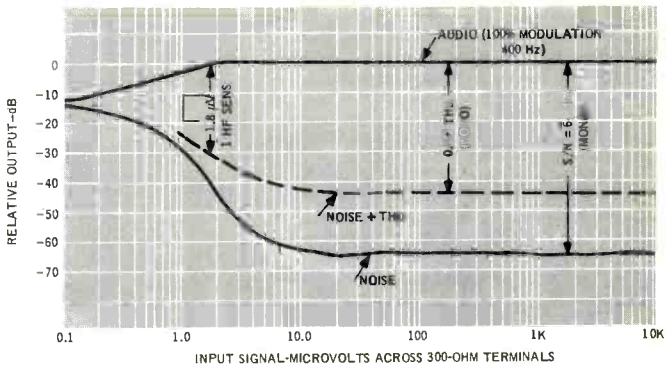


Fig. 3—Mono FM characteristics.

Electrical Measurements

FM monophonic performance is depicted in the graph of Fig. 3. IHF sensitivity turned out to be exactly 1.8 μV, as claimed, while ultimate signal-to-noise ratio exceeded the 60 dB published figure by fully 4 dB, for a reading of 64 dB. THD in mono measured 0.6%, a bit poorer than claimed, but still in the "low distortion" category. Of interest is the quieting attained with a signal input of only 5 microvolts—it measures 58 dB on our unit. The 50 dB quieting figure (which we have come to consider as the *truly* usable input signal strength) occurs with an input signal strength of just under 3 microvolts.

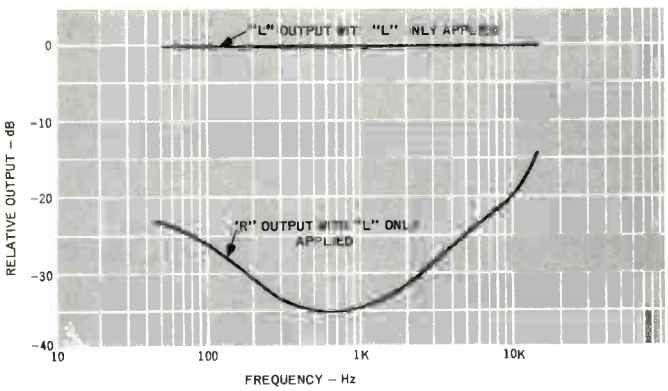


Fig. 4—Stereo FM separation characteristics.

Stereo FM separation is plotted in Fig. 4 and distortion characteristics (at mid frequencies) are shown in Fig. 5. While the THD curve confirms or exceeds published claims (rated distortion is reached at 29 watts per channel with 8 ohm loads as opposed to 27 watts claimed), the IM distortion curve reaches the rated figure at 26 watts—just below rated output.

Power bandwidth, shown in Fig. 6, extends from 6 Hz to 40 kHz, just about what is claimed for the unit. In addition

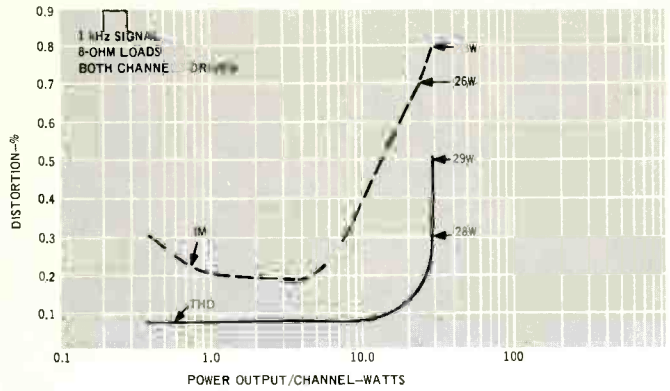


Fig. 5—THD and IM mid-band characteristics.

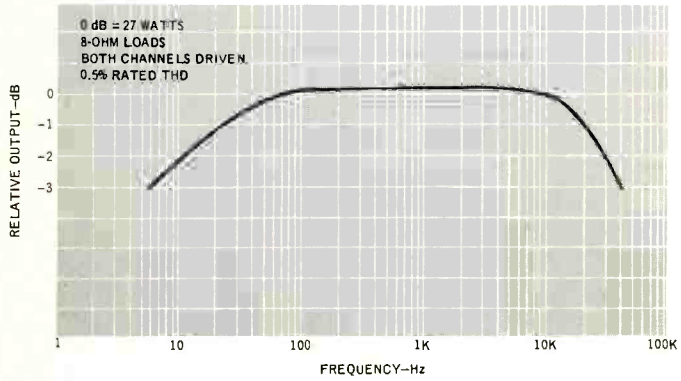


Fig. 6—Power bandwidth.

to these "full power output" measurements, we plotted harmonic distortion at all audible frequencies for two power output levels—10 watts per channel and 20 watts per channel. In each case, both channels were driven simultaneously and 8 ohm loads were used. The results are shown in Fig. 7 and, at the 20 watt level, THD approaches rated 0.5% only at the very lowest frequency measured. At the 10 watt level, all measurements at all frequencies were comfortably below the rated THD figure.

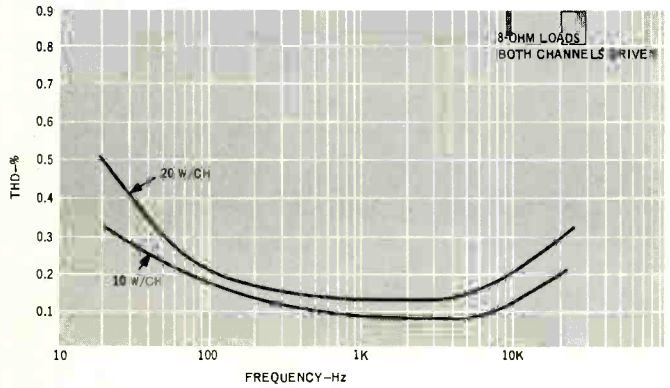


Fig. 7—Distortion vs. frequency at two power levels.

Figure 8 shows the preamplifier control ranges for bass, treble, high frequency filter, and loudness circuits and is seen to conform quite closely to published specifications. Though only one channel's results are shown, both channels were within 1 dB of each other in both tone and filter action. The high frequency filter has a turnover frequency of approximately 5 kHz which makes it useful for noise reduction even though the slope is only 6 dB per octave. All equalization specs for phono inputs were within the 1 dB of the RIAA curve, as specified.

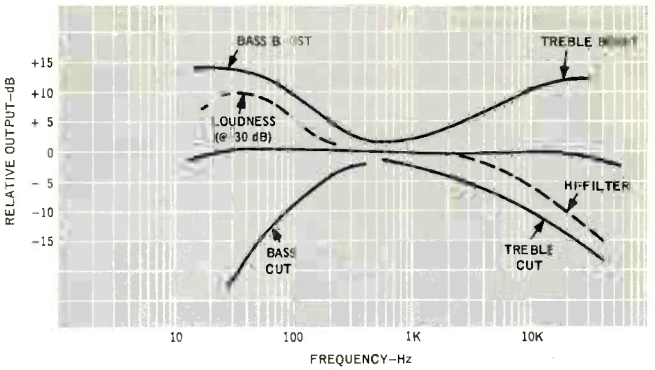


Fig. 8—Tone, filter and loundess control characteristics.

Listening Tests

Operated with medium efficiency speaker systems, the Panasonic SA-5800 had more than enough power to provide a room-filling clean musical program. In fact, two sets of such medium efficiency systems did not noticeably tax its power output capabilities. With really low efficiency types, however, the SA-5800 would have been unhappy with more than a single pair. Our listening room measures about 15 feet by 25 feet and might be classified as "medium" in its absorbtion characteristics.

The FM section behaved almost exactly like its counterpart in the more expensive Panasonic receiver tested some months ago, so that if you feel that 27 watts per channel is all the power you need in your installation, you need not worry about concomitant "downgrading" of the FM section—there isn't any. With the muting switch in the ON position we were able to receive some 44 signals acceptably, of which 26 were transmitting stereo programming. Defeating the MUTE circuit raised the number to 49, and of the new five, three were still acceptably free from background noise. This would seem to indicate that perhaps Panasonic should take advantage of its excellent quieting characteristic and re-adjust the muting threshold level to a somewhat lower point (there is no means for the user to perform this adjustment)—say 4 or 5 microvolts instead of the 7 μV where it is now set.

It should be noted, too, that the AM circuitry of the SA-5800 is not a perfunctory addition. It *really* sounds noticeably better than a good many AM sections of other receivers we have tested, and when we listened to the one or two stations in our area which profess to transmit AM with increased frequency response, we could actually hear the difference. While no distortion specification is offered in the published specifications, we were so impressed with this "rarity" that we took the set back to our labs after the listening tests and were pleased to find that THD at 30% AM modulation was less than 1%—quite an achievement for the so-called "lo-fi" medium.

In summary, then, the Panasonic SA-5800 should make an excellent "electronic heart" of a stereo system in which super-high power is not required and where budgets are modest compared to the desire for near-perfection in performance.

Len Feldman.