Equipment Profiles

MANUFACTURER'S SPECIFICATIONS
FM Tuner Section
IHF Sensitivity: 1.9 μV. **S/N:** 65 dB. **Selectivity:** 65 dB. **Capture Ratio:** 1.5 dB. **THD:** Mono, 0.3%; Stereo, 0.4%. **AM Suppression:** 50 dB. **Image Rejection:** 55 dB. **I.F. Rejection:** 60 dB. **Spurious Response Rejection:** 60 dB. **Stereo Separation:** 40 dB, 1 kHz. **Frequency Response:** 20 Hz to 13 kHz ±1 dB. **Carrier Suppression:** 50 dB.
AM Tuner Section
IHF Sensitivity: 20 μV. **Selectivity:** 25 dB. **Image Rejection:** 40 dB. **I.F. Rejection:** 40 dB.
Amplifier Sections
Power Output Per Channel, Minimum Continuous (RMS), All Channels Driven, 8-ohm Loads at Maximum Total Harmonic Distortion of 0.5%: 26 watts, 4-channel mode; 80 watts, 2-channel mode. **Damping Factor:** 20, 8 ohms. **Input Sensitivity:** Phono, 2.0 mV; AUX, Tape, 180 mV. **Hum and Noise:** Phono, 70 dB; AUX, 90 dB; residual, 1.5 mV. **Frequency Response:** Phono, RIAA ±1 dB; AUX, 7 Hz to 70 kHz, +0,–3 dB. **Tone Control Range:** Bass, ±11 dB @ 50 Hz; treble: ±10 dB @ 10 kHz. **Low Filter Cut-Off:** 200 Hz @ 6 dB/octave. **High Filter Cut-Off:** 7 kHz @ 6 dB/octave.
General Specifications
Maximum Power Sumption: 360 watts, at 120 V, 60 Hz. **Weight:** 37.3 Lbs. **Dimensions:** 21-3/8 in. W x 6-1/8 in. H x 15-1/2 in. D. **Retail Price:** $739.95.

For many, the chief objection to earliest all-in-one four-channel receivers was their low power output per channel in return for quadraphonic flexibility, and the apparent aim of the new SA-8500X is to counter these objections, which it does most successfully. Here is a receiver that supplies more than 25 watts per channel into 8-ohm loads at all audio frequencies, in accordance with the strict power output disclosures required by the new FTC power rule. Switch it to what Technics calls the BTL mode (more familiarly known as "strapped" two-channel operation) and you have at your command up to 80 watts of power for each of the two channels then available.

Having gained experience with the CD-4 quadraphonic disc format (Technics by Panasonic was one of the first companies to champion quadradiscs in this country), they have refined that circuitry in this latest receiver, making it much easier (and less critical) than in earlier products. Matrix decoding, however, takes a back seat to CD-4 demodulation, with two simple matrix positions available, but with no logic circuitry added. One of the two matrix positions corresponds to RM (Regular Matrix, as standardized in Japan), the other comes close to SQ parameters (though Technics neither says so nor labels the position that way).

The front panel of the SA-8500X is one of the most impressive we have seen since the dawn of four-channel sound in home equipment. The upper, blacked-out area (illuminated when power is applied) has four level meters at the left, one for each channel. In addition to assisting you in balancing all four channels, I must confess that psychologically I always feel better when tinkering with four-channel program sources when I am able to SEE (as well as hear) different things happening in each channel. A 10-dB push-button switch has been wisely added, so that meter sensitivity can be increased by that amount and meters be read easily even when sound levels are fairly low. The well-calibrated AM and FM dial scales are surmounted by channel indicator lights which spell out mode of operation (4-CH DISCRETE, 4-CH. MATRIX, STEREO, etc.), while below the scale are more illuminated words which identify pushbuttons such as the three available tape monitor buttons, FM MUTING switch, and the aforementioned meter sensitivity switch. Lights also tell you program source chosen while at the extreme right is a signal-strength tuning meter active in both FM and AM modes. A separate power ON/OFF switch is located center-left on the panel.

The lower section of the panel contains a pair of headphone jacks (for four-channel phones), bass and treble controls, a large master-volume control surrounded by four individual channel-level controls, mode selector, program-selector switch, and a large tuning knob. Secondary controls in this area include low- and high-filter switches, loudness control, and audio-muting switch (not to be confused with FM muting) which lowers overall volume level by a fixed 20 dB when answering the phone, doorbell, etc. Finally, there is a CD-4 "High Blend" switch intended for use when CD-4 records are unduly noisy. With the switch in use, noise is reduced with some minimal sacrifice in high-frequency channel separation—much like the familiar "MPX filter" popular on some stereo tuners and receivers for accomplishing the same objective when listening to weak or noisy stereo FM signals. The now almost-standard "radar light" blinks on whenever a CD-4 record is played, appearing in the upper dial-scale area along with the other previously noted lights.

Fig. 1—Rear panel of the SA-8500X

The rear panel of the SA-8500X, shown in Fig. 1, may set a new record for number of input and output jacks and terminals. Three full tape-monitoring facilities (in four-channel) means no less than 24 jacks, in addition to a full four-channel AUX input arrangement, enough speaker terminals for two four-channel speaker setups, 300-ohm, 75-ohm, and AM antenna terminals, switched and unswitched a.c. convenience outlets, and a four-channel FM detector output jack for future use with a four-channel FM decoder. Each speaker line is fused, with transparent covers over each pair. Two types of phono inputs are provided. Conventional ones for magnetic cartridges require no further explanation. The other pair, intended for semiconductor cartridges (one of which is manufactured by Technics by Panasonic), deliver a bias voltage required by this type of phono pickup, so that no separate power supply is required when they are used with this receiver. A two-position switch near the phono inputs selects either pair of terminals (they cannot both be used simultaneously), while three-position slide switch, identified as a 30-kHz compensator switch, is intended to help adjust frequency response of the CD-4 input circuitry to compensate for less than perfect CD-4 cartridge that have dips or peaks at the high end of the response. With reasonably good cartridges, this switch position should be left in the NORMAL position.

Circuitry Highlights

An internal view of this massive chassis is pictured in Fig. 2. Power amplifier circuits, seen standing vertically, each include a first-stage differential amplifier, followed by direct-coupled circuitry out to output-capacitorless power stages. Operation in the strapped mode (in which pairs of amplifiers are effectively paralleled for greater power output) is selected on the front panel by the speaker-selector switch. A direct-coupled I.C. circuit is used for the phono equalizer section of the receiver. Perhaps the most outstanding new feature of the CD-4 portion of the receiver is that fact that separation and carrier level adjustments are no longer required (they were with all earlier receivers whenever you changed or installed a new cartridge).

The FM front-end uses a four-pole MOSFET and the variable capacitor is designed so that dial calibration is linear. The i.f. section employs five stages, three of which are differential amplifiers, and there are three two-element ceramic filters for achieving desired band-pass characteristics. The AM section also employs a ceramic filter. The stereo FM decoder circuit includes a monolithic IC which incorporates two differential switching or demodulation circuits.

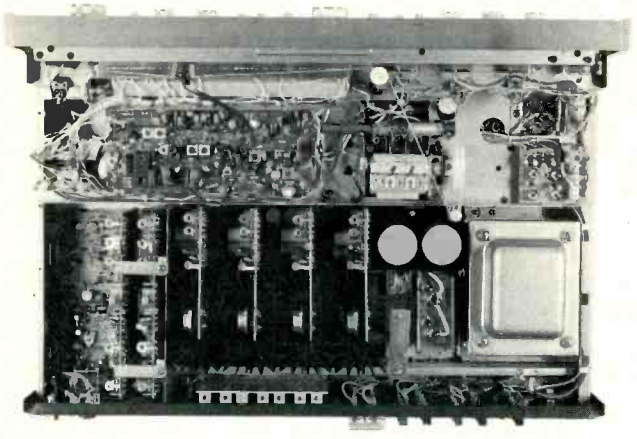


Fig. 2—Internal view.

FM Performance Measurements

We measured an IHF sensitivity of exactly 1.8 μV for the SA-8500X receiver, but in terms of quieting, 50 dB of S/N was reached under signal input conditions of only 2.0 μV, as shown in Fig. 3. Ultimate quieting in mono was 71 dB, considerably better than the nominal 65 dB claimed by the manufacturer. THD in mono was also excellent, at 0.2% for mid-frequencies. In stereo, the same test resulted in 0.32% THD, still very good, and the best signal-to-noise ratio obtained was 65 dB. Selectivity was closer to 70 dB than to the 65 dB claimed, while capture ratio measured 1.3 dB, image rejection was 60 dB, and AM suppression was 53 dB.

Stereo-FM separation, plotted in Fig. 4, was 42 dB at mid frequencies, remaining as high as 40 dB all the way down to 50 Hz, and decreasing to 30 dB at 10 kHz. Figure 4 also shows that THD is maintained at low levels for all audible frequencies. At 7 kHz, THD measured 0.5% in mono, 1.0% in stereo.

AM sensitivity was measured as 25 μV, via the external antenna terminal input, while selectivity actually proved to be a bit better than claimed, measuring 27 dB on our sample.

New Measurements For Amplifiers

In keeping with the editorial policy of AUDIO magazine, we have begun testing power amplifiers and the power amplifier sections of receivers in accordance with the new Federal Trade Commission Rule which went into effect last November. While we do not agree with all the provisions and requirements of this rule, it does serve a useful purpose in partially clarifying power output claims and, until it is modified or something more meaningful (and even less ambiguous) comes along, we shall continue to report our findings a la the FTC rule.

First, it should be noted that the literature supplied with our unit (including the owner's manual) was printed before the rule went into effect, and so we had to search through several kinds of power ratings before arriving at the fact that Technics by Panasonic claims 26 watts per channel from 20 Hz to 20 kHz, with 8-ohm loads, all channels driven, at no

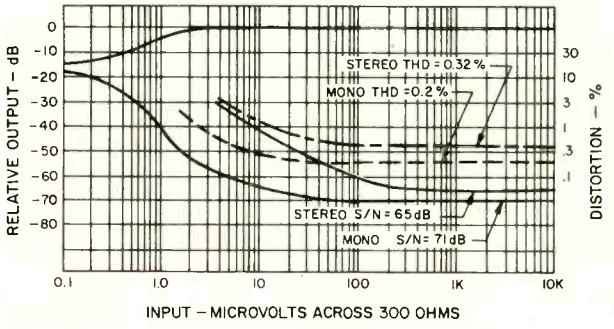


Fig. 3—FM quieting and distortion characteristics.

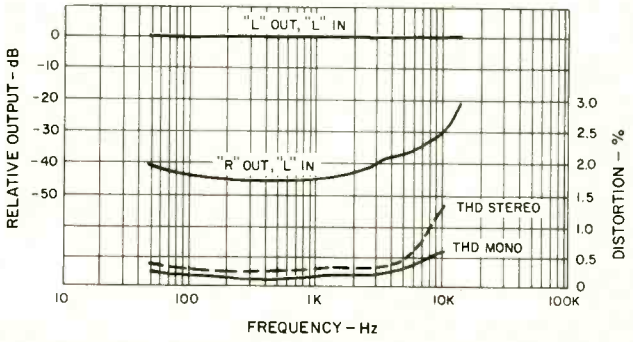


Fig. 4—FM separation and distortion versus frequency.

more than 0.5% THD. (We shall continue to use the abbreviation THD even though the FTC says it is an unfamiliar term and must not be used by manufacturers who are required to spell out "Total Harmonic Distortion" each time. If any reader still has doubts about the meaning of THD at this point, please forgive our attempt at brevity).

On that basis, we ran the receiver, with all channels driven to a power output of 8.7 watts into 8-ohm loads for one hour continuously. This is the so-called preconditioning test about which there has been so much debate within the industry. The SA-8500X heat sinks warmed up considerably (as would be expected) but no fuses popped, no circuits failed, and we were able to go on with full-power measurements. Not only were we able to produce 26 watts per channel in the four-channel mode at 20 Hz and 20 kHz following this preconditioning test, but the THD observed at these two frequency extremes was 0.1% at 20 Hz and 0.13% at the high end—both well below the 0.5% maximum claimed by the maker. Breathing a sigh of relief, we went on to find that at mid-frequencies (where, FTC notwithstanding, there is still much music to be heard), each channel produced just over 35 watts into 8-ohm loads, as plotted in Fig. 5. IM distortion (up to now ignored by the FTC) measured 0.5% at an output of 32.7 watts per channel, also plotted in Fig. 5.

In the "strapped mode," we only made one measurement—and that was at mid-frequencies, where we observed an output of 87 watts per channel, with both channels driving 8-ohm loads. Those technically familiar with the "strapping" circuit will appreciate that using ordinary bench test equipment it is difficult to make complex measurements because of "common ground" problems. When receivers are used in this mode in home applications, however, no problem is encountered since each speaker has its own twin-wire cable leading back to the receiver and there are no "common ground" points. It should be noted that Technics by Panasonic claims 80 watts per channel in the strapped mode, into 8-ohm loads, from 20 Hz to 20 kHz and, based on the reserve measured at mid-frequencies, we have no doubt but what they "make it."

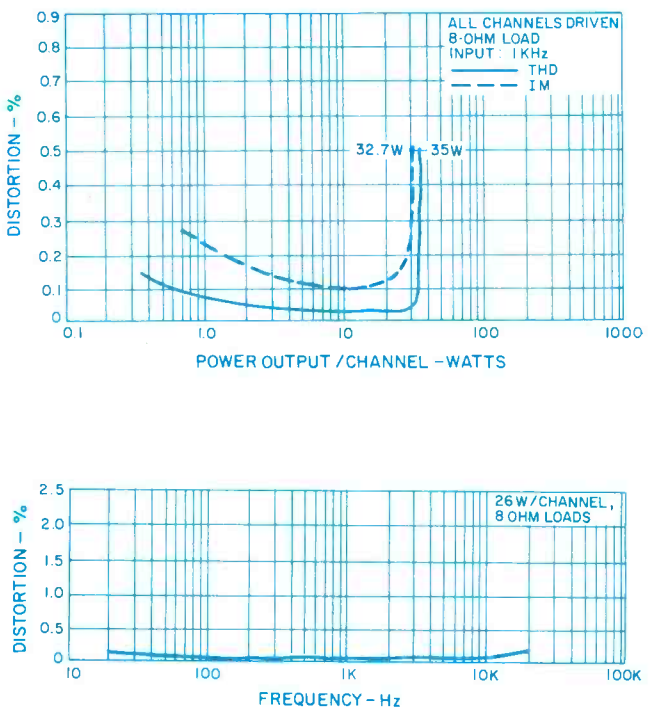


Fig. 6—Distortion versus frequency.

Not content with just end-frequency measurements, we plotted full-power output (26 watts per channel, etc. etc. etc.) at all frequencies against THD and the results are shown in Fig. 6.

Figure 7 shows tone-control range, filter action, and loudness compensation referenced at -30 dB from full volume. The low filter, though sloped at only 6 dB per octave, is more effective than a bass control in reducing audible rumble with minimum loss of lows, whereas the high-cut filter does little more than the treble control rotated to nearly its most counterclockwise position.

Phono and high-level input sensitivities corresponded closely with published claims, while phono overload capability was measured as 60 millivolts RMS. Hum, in phono was 70 dB exactly as claimed. Hum referred to high-level inputs was in excess of 80 dB. Frequency response from high-level inputs to output, with tone controls set for mechanically flat position was within 1 dB of "flat" all the way from 3 Hz to 30 kHz.

Listening and Use Tests

Most of our listening tests were confined to CD-4 records, since it is in this area of circuitry that Technics by Panasonic seems to have made greatest strides in this new receiver. We purposely substituted a few of the earlier CD-4 cartridges we have in our possession just to see if they would produce any better results with the new CD-4 circuitry than they did when tested a year or two ago with "earlier" demodulators. They did! This new CD-4 circuit certainly makes up for deficiencies elsewhere in the CD-4 chain, whether it be in less than perfect records or cartridges. But to really appreciate how good some CD-4 records can sound, you should equip your tonearm with a late model CD-4 cartridge of known reputation, set a recent CD-4 release to spinning, and feed those complex signals through that new demodulator circuitry. It may change your mind (if you've been negative) about the future of CD-4. In this reviewer's opinion, it's here to stay—so long as we can find equipment like the SA-8500X through which to play it!

There's not much we can say about the matrix circuitry incorporated in the SA-8500X, other than to point out that it does about what you would expect from circuitry without "logic" augmentation. With all those tape-monitoring facilities, you'll probably have room for an add-on matrix decoder if you want better matrix separation than is obtainable from either the MATRIX 1 or MATRIX 2 switch settings on the SA-8500X. Of course, you can always decide about that later on. No doubt many music lovers will be content with the simple matrix system already built in.

While we were impressed with the 80+ watts capability of the receiver in the strapped mode, our listening tests were

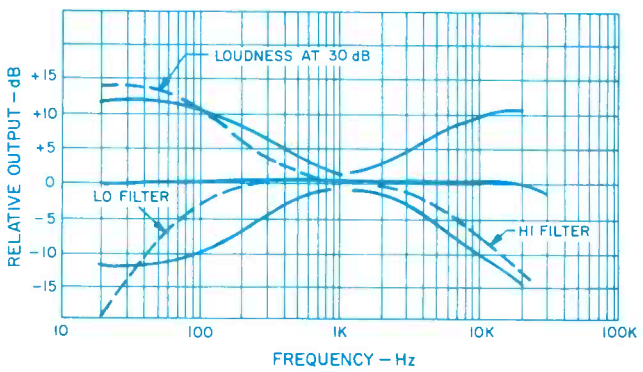
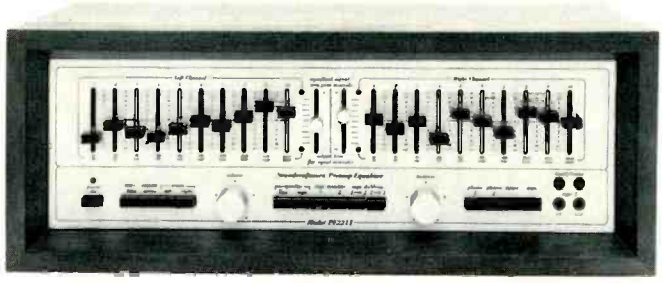


Fig. 7—Tone-control range, and filter and loudness circuit characteristics.

confined to four-speaker applications, but we found that the SA-8500X offered plenty of drive power for our moderately low efficiency test speakers. Since the SA-8500X is, first and foremost, a receiver, we devoted the remainder of our listening time to FM and were happy to note that the low stereo-switching threshold (about 4 μV) plus the excellent quieting-slope characteristics of the tuner section enabled us to enjoy all the mono and stereo stations received in our area with relative freedom from noise and audible distortion. If only a single tuning meter was economically feasible, we would have preferred a center-of-channel type (and been willing to forego meter action in AM), but it's a relatively minor quibble. Even stereo broadcasts are more fun when "dematrixed" into synthesized quadraphonics we find, and that's the way we listened to them (as well as to the few four-channel matrix broadcasts we encountered) and will continue to listen to them until the FCC gives us something to plug into that FOUR-CHANNEL DETECTOR jack at the back of this excellent receiver. *Leonard Feldman*

Check No. 60 on Reader Service Card

Soundcraftsmen PE 2217 Preamp-Equalizer



MANUFACTURER'S SPECIFICATIONS

Frequency Response: ± ¼ dB 20 Hz to 100 kHz. **Harmonic Distortion:** Less than 0.05% at 1.0 volt. **Intermodulation Distortion:** Less than 0.05% at 1.0 volt. **Signal-to-noise Ratio:** Phono, 84 dB below 10 mV input; Equalizer Section, 90 dB below 1 volt input. **Input Impedance:** Phono, 47 K; High Level, 50 K. **Maximum Output:** 5 volts into high impedance; 2.5 volts into 600 ohms. **Dimensions:** 20 in. W x 11¼ in. D x 7½ in. H. **Price: $499.50.** Simulated walnut case supplied. Walnut wood case optional, $50.

No doubt about it, an equalizer is a most useful piece of equipment to have, particularly for tape enthusiasts or those who have poor listening rooms (I refer to the acoustics, *not* the decor—I once saw a magnificent room furnished in good taste with heavy plush carpeting which extended *right up the walls!* As you might expect, it was hopeless as a listening room. Even the Steinway piano sounded muffled. *No* equalizer could have corrected sufficiently.)

The only possible disadvantage in using a graphic equalizer is the extra shelf space and cable connections required. If you also have a preamplifier, an FM tuner, and a quadraphonic decoder, connecting an equalizer could complicate matters if you also wish to hook up a tape recorder. Partly to simplify things, Soundcraftsmen has now combined a graphic equalizer with a state-of-the-art preamplifier. In so doing they've made it possible to save space and simplify cabling, at the same time reducing the cost of the total setup.

The equalizer section is very similar to the Model 20-12 which we reviewed in AUDIO in December 1971. It has 10 slide controls for each channel, each handling about one octave, and providing maximum boost or cut up to around 14 dB. An added feature is a set of four visual indicators called *Test Lites* which permit balancing the signals going into and coming out of the equalizer section.

Watching these Test Lites one can readily control the overall gain of the equalizer section to keep it at (or near) zero. This is necessary because it is possible to adjust several of the octave tone equalizers for maximum gain, thus supplying too much signal to the amplifier following the preamp-equalizer. To set the controls properly one has only to set them so that the two Test Lites for the input signals and those for the output signals have roughly the same brilliance. The adjustment is not at all critical.

A separate pushbutton controls the use of the Test Lites; if that button is in the *off* position the upper two lights will monitor the output of the equalizer.

Looking at the controls, at the bottom left we find a bank of four buttons for Test-Lites, Reverse, Mono-left, and Mono-right. After the Volume Control comes a group of six pushbuttons. These switch the equalizer in or out of the main amplifier signal path, or the tape recording signal path. They also select *tape 1* or *tape 2*, and permit dubbing from either of two tape decks onto the other one. Next comes the channel balance control, and a last group of four buttons for *phono 1, phono 2, tuner,* and *AUX*. Jacks for stereo headphones (two sets) and 1 for Tape In and Tape Out are at the right hand end.

The power *on-off* switch is at the extreme left, while directly in the center of the unit, between the banks of equalizer sliders are the four Test Lites and the two gain controls.

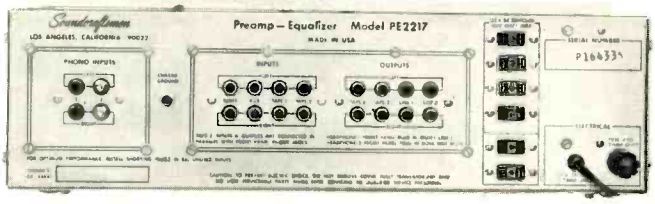


Fig. 1—Rear panel of the Soundcraftsmen PE2217 Preamp-Equalizer.

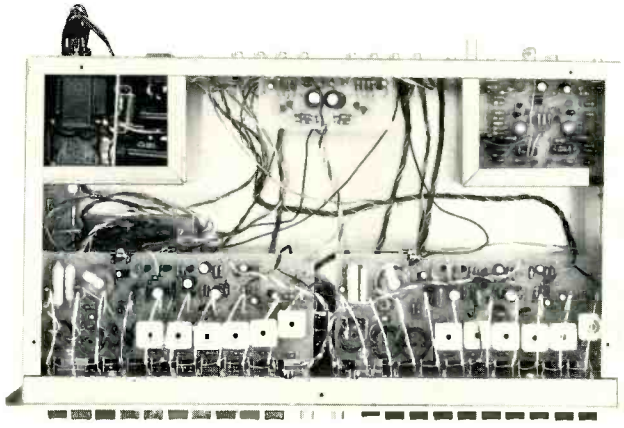


Fig. 2—Internal view of the chassis.