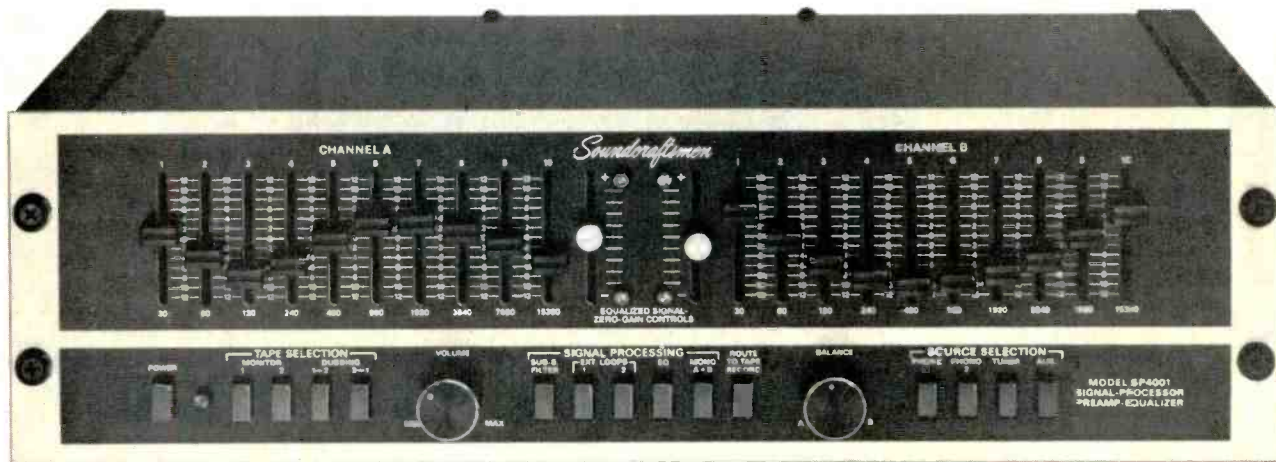


Soundcraftsmen SP 4001 Preamplifier-Equalizer



Manufacturer's Specifications

Phono Section

RIAA Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.

Harmonic Distortion: Less than 0.01 percent.

Signal/Noise Ratio: 97 dBA.

Line Amplifier Section

Frequency Response: ± 0.25 dB, 20 Hz

to 20 kHz.

Harmonic Distortion: Less than 0.01 percent.

IM Distortion: Less than 0.01 percent.

Signal/Noise Ratio: 105 dBA re: 10 V output.

Equalizer Section

Same as line amplifier section, plus

Octave Control Range: ± 16 dB with all controls at maximum, ± 12 dB with all other controls at zero.

Zero Gain Control: $+6/-12$ dB range.

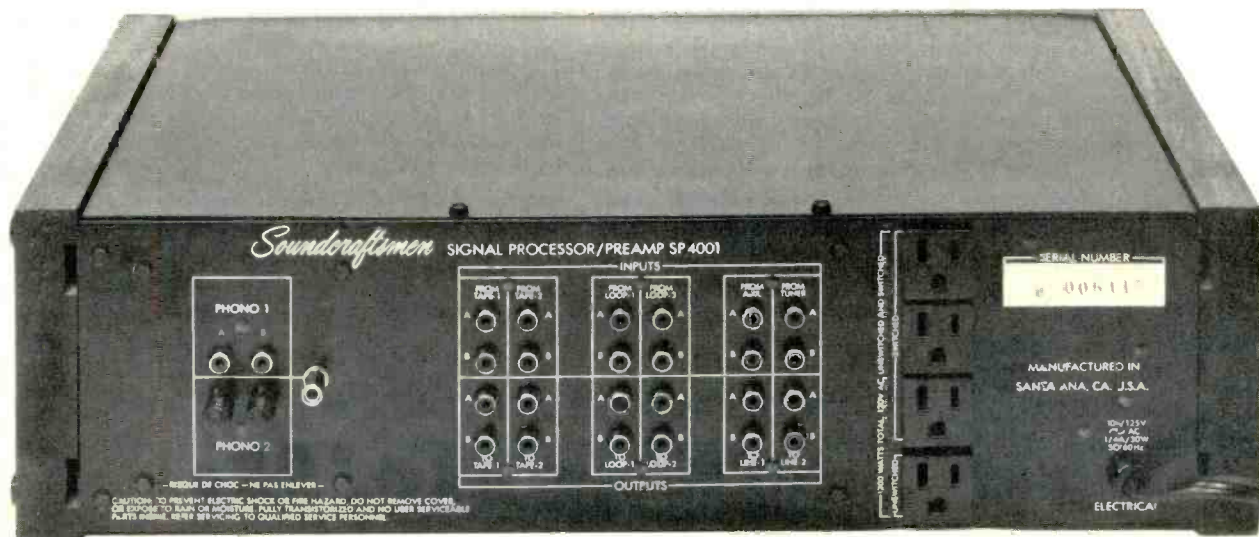
Dimensions: 19 in. (490 mm) W x 5 1/4 in. (135 mm) H x 11 in. (280 mm) D.

Weight: 23 lbs. (10.5 kg).

Price: \$549.00.

The Soundcraftsmen SP 4001 is called a "signal-processor preamplifier-equalizer" by the manufacturer, and the combination does have some synergistic properties. It is a single unit with internal interconnections, there is no need for regular tone controls, and there is a price advantage over buying separate units. All designations and scales on the front panel are easily read with white lettering against a black background. The 10 equalizer-filter bands are numbered at the

tops of the vertical controls. The center frequencies are listed at the bottom, starting at 30 Hz and doubling for each band, up to 15,360 Hz at the end. Between the two sets of boost/cut sliders with ± 12 dB ranges are the two channel "equalized signal-zero-gain" controls for matching the gain with EQ to the gain without EQ. Top and bottom LEDs with each control indicate the need for gain increase or decrease, and equal intensity of the LEDs verifies that the level of the total



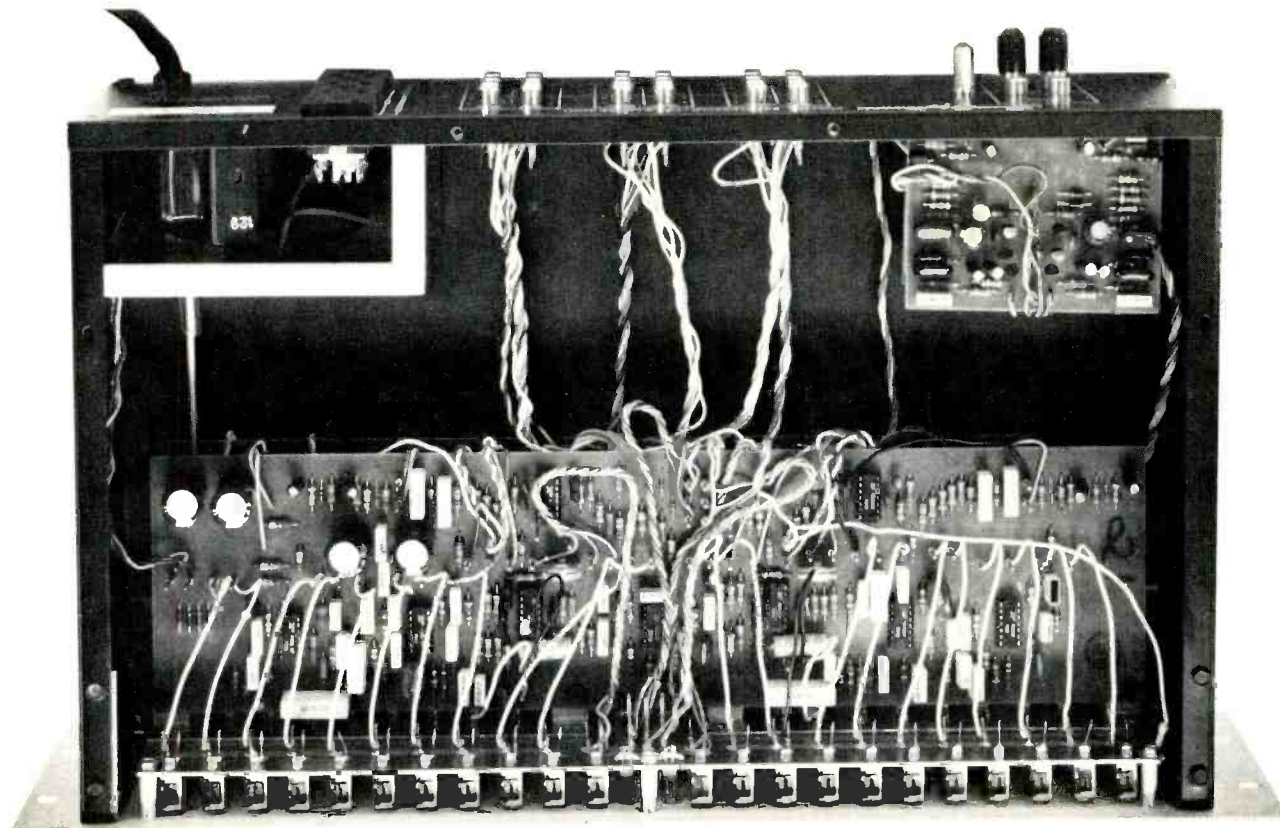
spectrum with EQ matches that without. This is a very worthwhile feature which ensures there will be no large jumps in level with EQ in/out switching. As a result there will be less shock to the nerves, and the effects of the EQ are easier to judge, to say nothing about preventing damage to amplifiers and speakers.

There are four interlocked push-button switches for source selection: *Phono 1*, *Phono 2*, *Tuner* and *AUX*. The SP 4001 is unusual in that there are separate preamp sections for the two phono inputs, and selection is actually made at line level. My own experience has included many examples of system problems because of "minor" contact resistance in connectors and switches, aggravated when at low-level points. For those who want to be able to select between two turntables, this must be considered a good feature. There are six non-interlocked "Signal Processing" push-button switches: *Sub-sonic Filter*, *Ext. Loop 1*, *Ext. Loop 2*, *EQ*, *Mono A + B*, and *Route to Tape Record*. The external-loop functions permit inserting any external device in the signal path, perhaps a dbx II processor or a bandpass filter — whatever you want. *Route to Tape Record* shifts the processing section out of the main line signal path and inserts it into the feed to the unit's two sets of tape-out jacks. Four non-interlocked push-button switches for *Tape Selection* offer *Monitor 1* and *2*, and *Dubbing 1-to-2* and *2-to-1*. In this fashion, it is possible to control dubbing from one recorder to the other at the same time that

the main part of the unit is used for something else.

The power on/off switch is also a push-button design, and there is an adjacent red indicator. The multi-step volume and the center-detented balance controls have good-sized knobs with excellent fine knurling, an aid to easy adjustment. The Soundcraftsmen unit is supplied with wood end pieces and stick-on feet, so it can be placed on a shelf or table. With the removal of the end pieces, the SP 4001 can be immediately rack mounted, requiring a 5¼-inch space. On the back panel are all of the input/output phono jack sets for *Phono 1* and the other sources, two tape recorders in/out, two external loops in/out, and two sets of line out jacks, which actually have low enough impedance to drive headphones. There are three switched and one unswitched a.c. outlets with a total capacity of 1200 W, much better than so many units which commonly have a limit of 300 W or so. The outlets and the power cord are all three-prong, not usually found in such equipment.

With the removal of the steel top cover, it was possible to examine the internal construction. There was excellent soldering on the p.c. boards, two large ones for the majority of the electronics and two small ones for the phono preamps. There were a number of ICs (in sockets) used on the main boards, while the phono preamps used discrete components. There was no parts identification noted on the cards. Wirewrap was used for intercard connections. With the top



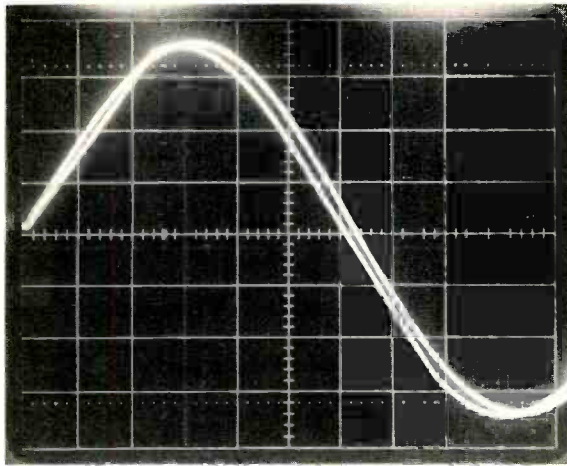


Fig. 1 — Slew limiting with 2.5-V, 40-kHz input signal and 5-V output. (Scales: Horizontal, 2 μ S/div.; vertical input, 1 V/div. with output adjusted to match input display.)

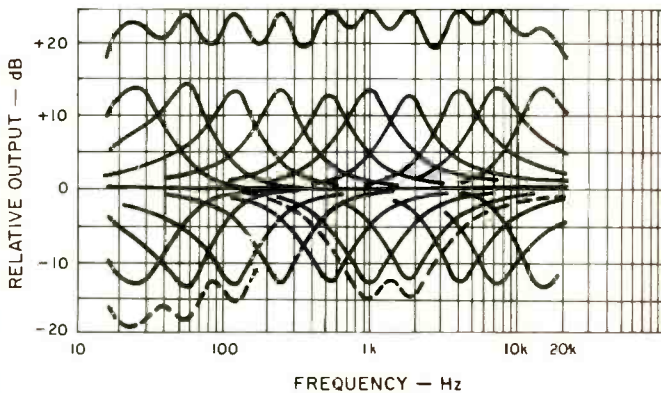


Fig. 2 — Frequency responses of individual filter sections at maximum boost and cut, of unit with no boost or cut, and with all sections at maximum boost. Dashed lines show results with 30-, 60-, and 120-Hz filters at maximum cut and also with 960- and 1920-Hz filters at “-10.”

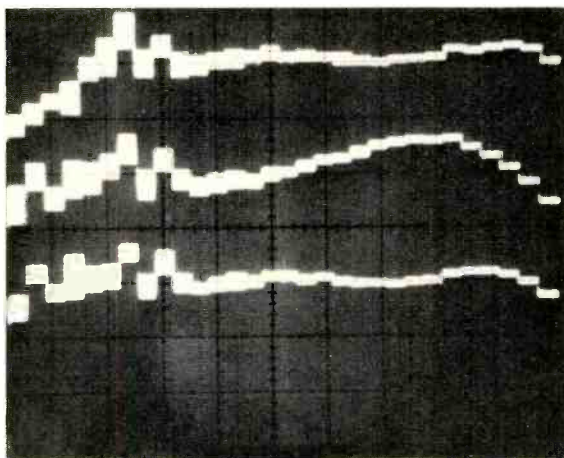


Fig. 3 — Use of EQ to improve recorder response. Top: Pink noise on RTA in “Source.” Middle: Playback without EQ. Bottom: Record/playback response with EQ.

cover replaced, the components were effectively enclosed in a steel box chassis which was quite rigid.

Performance

As some of the information from Soundcraftsmen was preliminary, there was a little confusion on reference levels for some of the specifications, and also whether some things were actually specified or just indicated as typical. The first checks were made on the two phono preamps, really four mono preamps in configuration. All sections reached overload at 120 mV with a 1-kHz test signal. Sensitivity was 17 mV for 1 V out at the tape-out jacks and 1.48 mV for 0.5 V at line out with maximum volume. All sections had frequency responses within ± 0.6 dB with the inverse-RIAA test network used. Most values were within 0.3 dB or better, and there was very close correspondence among all four. With 20-mV drive, there was 1.1 V at tape out. THD was less than 0.006 percent at 1 kHz, about 0.02 percent at 20 Hz and 0.01 percent at 20 kHz. Signal/noise ratios were 81.4 dBA with 5 mV in and 0.5 V at line out, 92.8 dBA with 17 mV in and 1 V at tape out and 98.8 dBA with the Soundcraftsmen 2-V reference. All of the figures are equivalent actually, but the lowest figure goes with the IHF test standard.

With *AUX* input, the line sensitivity was 82 mV for 0.5 V out with max gain. Clipping was very symmetrical at 14 V rms output from 20 Hz up, with a gradual reduction at the highest frequencies. At 20 kHz the output limit was 8.5 V rms, above which slew limiting appeared. The frequency response was down 0.25 dB at 5 Hz and 40 kHz, down 3 dB at 1.5 Hz and 140 kHz. Slew limiting was made obvious with a 40-kHz signal (Fig. 1), with 2.5 V in and 5 V out, quite outside of normal conditions. Please note that the amplitude of the output was adjusted on the scope to match the input to make the linear slope of the slewing most obvious. The measured slew rate was 1.7 V/ μ S, quite sufficient for preamp operating conditions. With 0.5 V in and 2 V out, THD was 0.002 percent or so for most of the band, rising slowly to 0.0077 percent at 20 kHz, and to 1 percent at 81 kHz for a slew factor of 4.05. For the same levels, the SMPTE IM distortion was 0.002 percent. The signal/noise ratio was 91.5 dBA with the 0.5 V reference, 103.5 dBA referred to 2V.

With EQ selected (all controls at zero), there was no change in the distortion figures, except that IM increased slightly to 0.004 percent. The signal/noise ratio showed a slight change — to 91.2 dBA re: 0.5 V. With no special attention paid to zeroing the filter controls, just a fast push to detent, the frequency response was within 0.8 dB from less than 5 Hz to over 20 kHz, very good indeed. EQ out is best for the flattest response, of course. With EQ in, clipping did not occur until a very-high 10.4 V with gain-match adjustment for equal in/out level. The subsonic filter was measured to be down 1 dB at 20 Hz, 3 dB at 15 Hz and 10 dB at 8.5 Hz, a worthwhile feature to include.

The input overload on *AUX* was 17.2 V, unlikely to be reached with normal inputs. The distortion increased very little across the band with increasing drive and volume levels right up to the point of clipping, although slew effects caused distortion at 20 kHz to reach 0.1 percent at 7.18 V output. Actually, that's pretty darn good, unmatched by many units. The output impedances were about 600 ohms for tape outputs and less than 8 ohms for line outputs. Input impedances averaged about 20 kilohms with some dropping off at the highest frequencies.

Closer attention was given to the filters themselves in the equalizer section. Fig. 2 shows the frequency responses of all of the individual filters at maximum boost and at maximum cut, all controls in detent, with all filters at maximum boost, with just the 30-, 60- and 120-Hz filters at maximum cut, and

finally with just the 960- and 1920-Hz filters at "-10." Filter shapes were fairly consistent with a $Q = 2.0$ at maximum boost. A one-octave bandwidth ($Q = 1.4$) was obtained with the 960-Hz filter boosted 11.5 dB. A Q of 1.0 existed with 9.6 dB boost. Center frequencies of the filters were not dead accurate, with some unequal spacing evident in Fig. 2. A recheck on the accuracy of setting the controls in detent showed that with a little care, the repeatability was ± 0.1 dB. With the match-gain controls in detent, selecting EQ increased gain 0.4 dB for both channels, acceptably close. The range of the controls was from +6.7 dB to -13.6 dB re: detent position. With a pink noise source, and a variety of equalizations set in, gain matching with the LEDs for guidance was always within 0.5 dB — excellent performance of a very worthwhile scheme. For good indication of the LEDs and easy adjustment of the match-gain controls, 150 mV was required at AUX. It was possible to match gain with an 80-mV input, but the process was a little fussy.

The stepped volume control seemed almost to be continuous, and it could be set between detents, but there were actually many steps of from 0.75 to 1.5 dB, with larger steps at the bottom of rotation. The two sections of the control tracked within a dB from maximum down more than 60 dB, superb performance.

In-Use and Listening Tests

All controls and switches were completely reliable, and no contact noise was detected in making any of the adjustments. The owner's manual for the SP 4001 is a stiff-paper, four-page summary of functions and a detailing of basic operating instructions, with a listing of typical test data and a simple block diagram. Also supplied are a test record and

what Soundcraftsmen calls "Computone" charts. The album includes equalizer instructions, which are particularly good on setting the equalized-signal zero-gain controls. There are instructions on using the test disc for room equalization, and there are additional helpful comments on the record itself. The Computone charts have scales imprinted for each of the boost/cut controls and the equal-gain sets. This full-size form can be cut to match any particular EQ, such as that for smoothing system response. There are a dozen forms, so many EQ combinations can be stored "in memory" for easy resetting.

To demonstrate the flexibility of the equalizer section, it was used to remove an excessive presence hump in the playback of a recorder. As Fig. 3 shows, this was done very well, without pulling down the highest frequencies as a tone control would have done. On the other hand, during the listening tests a bit of boost in the same region added some desired presence to the voices in Mahler's *Eighth Symphony*. There was a lot of most-satisfying listening with the SP 4001, in all its forms, preamp, equalizer and preamp equalizer. It was also used to insert dbx II processing at one point, using one of the external loops.

The Soundcraftsmen SP 4001 offers excellent performance across the entire audio band with very low noise and superbly low distortion, even with most any combination of boost/cut adjustments. Worthwhile features include separate phono preamps with high-level switching, a subsonic filter, input/output control for two tape recorders, push-button selection of external loops and the equalized-signal zero-gain control and indicator scheme. It is definitely an excellent value for anyone needing both a preamp and an equalizer.

Howard A. Roberson

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