EQUIPMENT PROFILE

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SAE A202 AMPLIFIER

Manufacturer's Specifications

Power Output: 100 watts per channel, 20 Hz to 20 kHz, both channels driven into 8-ohm loads; 105 watts at 1 kHz into 8-ohm loads; 150 watts at 1 kHz into 4-ohm loads.
THD: 0.025%.
SMPTE IM: 0.025%.
Frequency Response: 20 Hz to 20 kHz, +0, −0.3 dB at 100 watts; 10 Hz to 100 kHz, +0, −3.0 dB at 1 watt.
Dynamic Headroom: 1.2 dB.
Damping Factor: 70.
S/N: 110 dB, unweighted, re: rated output; 125 dB, A-weighted, re: rated output; 100 dB, A-weighted, re: 1 watt output.
Input Sensitivity: 1.0 V re: rated output.
Separation: 75 dB at 100 Hz; 53 dB at 20 kHz.
Dimensions: 19 in. W × 3½ in. H × 14 in. D (48.3 cm × 8.9 cm × 35.6 cm).
Weight: 31 lbs. (14.1 kg).
Price: $449.
Company Address: P.O. Box 60271, Terminal Annex, Los Angeles, Cal. 90060.
For literature, circle No. 91

From all outward and inside appearances, the A202 seems to be a rather conventionally designed Class-AB power amp. It is built using an adequately large power transformer and filter capacitors, with good heat-sink structures properly positioned to dissipate the heat generated by the output devices. The A202 uses a complementary design, with mirror-imaged circuits to individually process the positive and negative halves of a musical waveform. A ring-core power transformer is used for improved headroom and low-impedance performance stability.

One of the things that differentiate this amplifier from others in its power class is its unique speaker-protection circuitry. The A202 is equipped with a fail-safe relay protection circuit. If, under any circumstances, d.c. or subsonic frequencies appear at the amplifier's output terminals, the A202 will disconnect itself from the speaker loads and will remain disconnected until the problem has been corrected. The sensitivity of this protection circuit has been adjusted so that thumps caused by a tuner's muting, or by a user dropping a stylus on a record or flicking it to remove dirt or dust, will momentarily disconnect the speakers to prevent damage. However, some faint crosstalk across the relay can still be heard when the relay is open. The relay system includes a contact diode prevention circuit. This overcomes a problem often encountered with other relay protection circuits—a slight diode effect at high frequencies caused by oxidation forming on the relay leads.

The A202 also has an automatic thermal shut-off that will

The A202 protects speakers against d.c., subsonics and transient thumps, and protects itself against overheating.

power down the amplifier and let it cool if it has been overheated and poorly ventilated. If this occurs, the A202 will act as if it had been unplugged from the power line. After cooling, it will power itself up again automatically.

After the usual instructions about unpacking and installing this amplifier, the SAE owner's manual supplied for the A202 (as well as for the more powerful A502) offers a section entitled "A Short Story About Amplifiers." Essentially, this "story" spells out SAE's design philosophy when it comes to basic power amplifiers. I would call it a mildly conservative approach that emphasizes the need to accommodate a variety of unusual loudspeaker loads. Decrying designs which roll off bass response as a cost-saving measure, SAE is equally against those that offer d.c. coupling from input to output. As evidence that response down to d.c. is not required and is, in fact, poor design practice, they cite the fact that the RIAA playback curve for phonograph records calls for a 6-dB/octave roll-off below 20 Hz. And, as they rightly point out, should even a small amount of d.c. reach your loudspeaker's voice-coil winding, it will eventually cause the drivers to heat up, possibly melting the adhesive used to hold the voice-coil to the cone. It will also demagnetize the speaker's permanent magnet. They conclude by saying that d.c. on a loudspeaker can do absolutely no good (there's no audio information at "0 Hz") and will usually cause the loudspeaker system to deteriorate in quality, often to the point of failure. All this is by way of justifying the fact that the A202 and the A502 are a.c.-coupled power amplifiers. Both employ 4.7-μF input capacitors ahead of the FET differential input amplifiers.

Control Layout

Considering the fact that the A202 is a basic power amplifier, it has one of the most strikingly attractive front panels I have come across in a long while. Perhaps SAE's motive in making it as good looking as it is was to discourage users from hiding the component away in poorly ventilated locations. In any case, the focal point of the front panel is a display that incorporates, for each channel, a 10-segment LED power/dB level indicator and a peak-indicating LED. The 10-segment indicators show relative power in either average-response or fast-response modes. The peak indicator shows instantaneous peak excursions in the program material. The displays for each channel fan out in opposite directions along the panel's width; when no signal is applied, a single LED at the center of the display, labelled "Idle," remains illuminated. LEDs to either side of this central one are calibrated in 3-dB increments from −24 dB (corresponding to 0.37 watt into 8 ohms) to +3 dB, where 0 dB is the nominal rated power level (100 watts).

To the left of the display is a rocker that actually controls two separate push-on/push-off switches behind it. Each switch turns a set of speakers on and off, so two pairs of speakers can be used singly or together. A similar-looking rocker arrangement is found to the right of the display. Again, the rocker really controls two separate push-on/push-off switches. The first of these is the main power on/off switch. Labelled "Standby," it activates the a.c. power relay that completes the circuit to the power transformer. (The relay is logic-controlled and powered from a separate standby transformer that's always "on" so long as the power cord is plugged into a 120-V source.) The other end of this rocker, labelled "Fast Response," increases the LED power/dB level display's sensitivity so that the display more nearly shows peaks rather than average power levels.

All connections to the amplifier are made via a pair of phono-tip input jacks and two color-coded sets of quarter-turn quick-connect speaker terminals on the rear panel. The terminals will handle wire gauges from #16 to #12—and special speaker cables of heavier gauge if they have metal pin tips. SAE recommends that for runs longer than 25 feet, at least #14 gauge be used for 8-ohm speakers and #12 gauge be used for speakers having lower impedances.

Measurements

Driving fixed 8-ohm loads, the A202 delivered 112.5 watts of power at 1 kHz before reaching its rated THD level of 0.025%. SAE's broad-band rating of 100 watts per channel was obviously based upon the amplifier's low-frequency power-output capability, which measured 102 watts per

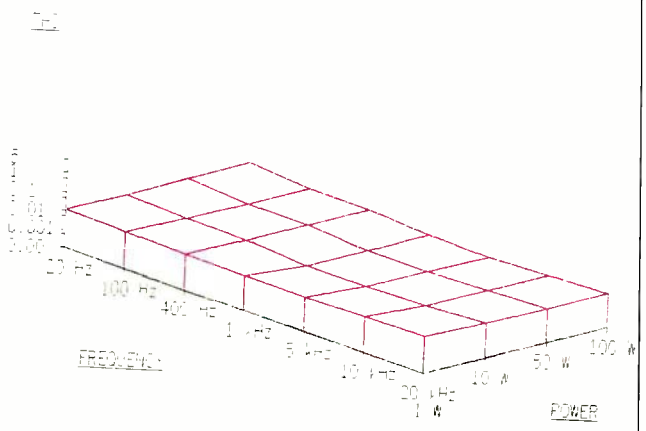

Fig. 1—Power output vs. THD and frequency for 8-ohm load.

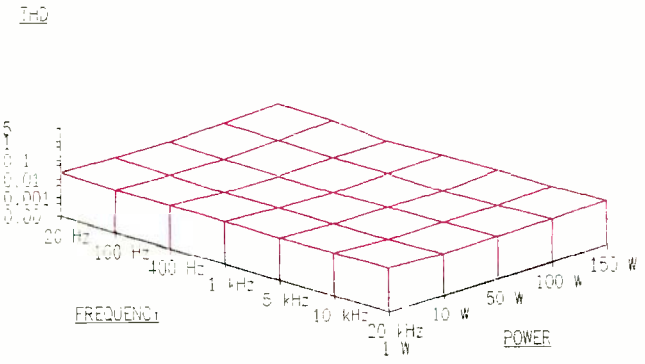

Fig. 2—Same as Fig. 1 but for 4-ohm load.

The very acceptable sound and long-term reliability of the A202 help make it an overall good value.

channel at the same THD level. Up at the 20-kHz end of the spectrum, the amp delivered almost as much power as it did at mid-frequencies: 111.01 watts per channel. The rated SMPTE IM of 0.025% was reached at an equivalent composite signal level corresponding to 116.3 watts per channel. Switching to 4-ohm loads, maximum power output at mid-frequencies was well above the SAE rating of 150 watts; I measured 161.2 watts per channel. This time, however, both low- and high-frequency output was restricted to 150 watts per channel for the rated THD level of 0.025%. Plots of distortion versus power-output levels and frequency are shown in Figs. 1 and 2 for 8 and 4 ohms, respectively.

I was surprised to find that the damping factor of the A202 was much higher than the certainly adequate 70 claimed by SAE. I measured a static damping factor of 330 for 8-ohm loads, using a 50-Hz signal as specified by the EIA Amplifier Measurement Standard.

Though SAE stresses the need for high current capability in modern amplifiers, the power levels achieved using 4-ohm loads suggest that the A202 is current-limited rather than voltage-limited. To produce a steady-state power level of 100 watts per channel into 8-ohm resistive loads requires a voltage of 28.23 V rms to be available at the output terminals, and the amplifier had no difficulty attaining this level. Current required for 100 watts into 8 ohms was just over 3.5 amperes per channel. With 4-ohm loads, however, the output voltage for even the higher 150-watt rating needs to be only 24.5 V rms, a value easily available from the A202's power supply. On the other hand, the current required for this power level is more than 6 amperes per channel (double that with both channels operating), which is about the limit of what the amplifier can supply. Had the A202's limits been based upon voltage, it should have been able to deliver double the 8-ohm power into a resistive 4-ohm load (200 watts per channel, instead of the rated 150 watts). All of this suggests that if this amplifier is to perform at its best, it should be coupled to speakers whose impedance does not dip much below 4 ohms at any frequency within the audible spectrum. If this precaution is not observed, it is likely that at peak loudness levels demanded by digital program sources, current limiting—and related nonlinear distortion—might take place from time to time, especially if you tend to listen at relatively loud levels.

CCIF (twin-tone) IM measured a mere 0.003% using 8-ohm loads; it increased very slightly to 0.0035% using 4-ohm loads. Dynamic headroom was a bit short of the claimed 1.2 dB, measuring 1.0 dB for 8-ohm loads and 0.83 dB for 4-ohm loads. Overall frequency response at 1 watt was flat within −1.0 dB from 4 Hz to 220 kHz, and the −3 dB roll-off point occurred at 300 kHz.

Input sensitivity measured 100 mV for 1 watt output. Translating this to rated output (100 watts into 8 ohms) yields 1.0 V, exactly as specified.

There seems to be, however, some discrepancy between the various numbers for A-weighted signal-to-noise ratio published by SAE. The company's spec relative to 1 watt is 100 dB. Taking this figure as our base, then S/N relative to 100 watts (rated output) would be 20 dB greater, or 120 dB. Yet, the published figure of A-weighted S/N relative to rated output is 125 dB. When asked about this difference, SAE said their original measurements were about 103 and 123 dB but got rounded off in different directions.

Normally, S/N in an amplifier is measured by applying 0.5 V of input and then reducing the output (by means of the amplifier's level control) so that only 1 watt of output is delivered to the load. Then the signal is removed, and the S/N ratio relative to that 1-watt output level is recorded. Because the A202 has no level control, I simply used the control on my test generator. This allowed me to set a signal level that would drive the amp to 1 watt output, which is a legitimate technique, albeit not quite within the terms of the test Standard. My measurement showed 87 dB, A-weighted, referred to 1 watt.

Use and Listening Tests

The A202 is in SAE's "high resolution" series of power amplifiers. If by high resolution they mean musical clarity, absence of audible distortion at normal listening levels, and good stereo imaging generated by wide-band response, with little or no phase shift even at the audio frequency extremes, then the A202 certainly qualifies. Incidentally, I noted during my bench tests that the amplifier does not invert input signals, an extra benefit for those listeners who feel that phase inversion of a music signal is a form of distortion or inaccuracy. I have yet to be convinced of this, but certainly agree that maintaining signal polarity from input to output can do no harm.

I would add, however, that listeners who play primarily digital material at rather loud levels through low-efficiency speakers can find, at times, that peaks seem somewhat compressed if not outright distorted. This is the current-limiting I talked about earlier, and it can show up under these particular conditions. Although I have not auditioned the higher powered version of this amplifier (the A502, priced $200 higher), I have a feeling that its 3 dB of extra power available for the load conditions specified would make an audible improvement during moments of peak power demands. The extra cost of the A502 would then be worthwhile. I should mention, too, that this higher powered model can also be operated in bridged mode, for an output power of 600 watts ito 8-ohm loads, should anyone desire that much power in a listening environment. Of course, then you'd need a pair of A502s. The A202, on the other hand, cannot be bridged in this way. In any event, the "dollars-per-watt" ratio of these SAE amps seems to be quite reasonable regardless of which of the two models you choose.

I did compare the sound of the A202 with that of a higher priced, d.c.-coupled unit that happened to be in my lab at the same time. Admittedly, this amplifier had higher power ratings, but as long as peaks (monitored on an oscilloscope) remained below clipping and current-limiting levels, I could detect no difference in sound quality between the two units. I can only conclude from this that SAE is quite right when they contend that the ability to "go down to d.c." contributes nothing to overall sound quality.

Overall, the SAE A202 offers good value for its price, very acceptable sound quality, and a measure of long-term reliability that should appeal to listeners who don't want to worry constantly about amplifiers harming their speakers or self-destructing. *Leonard Feldman*