

PIONEER SA-7800

MAGNI-WIDE STEREO INTEGRATED AMPLIFIER
WITH DC FLAT/"NON-SWITCHING" POWER AMP, CONTINUOUS 65W/CH

NON SWITCHING AMP

STEREO AMPLIFIER SA-7800



 PIONEER

PIONEER SA-7800

We've Incorporated "Cool Class-A" Concept in Our "Non-Switching" Amp for Amazing Improvements in Faithful Musicality.

- **MAGNI-WIDE POWER AMP** — Lower distortion over superwide frequency/power range in Pioneer-exclusive "Non-Switching" output.
- **NEW SUPER-LINEAR RETs & PIONEER VARI-BIAS** — Original and exclusive technical triumphs for higher fidelity.
- **DC CONFIGURATION AMPS** — Power and flat amps are DC to eliminate phase and transient distortion.
- **HIGH S/N RATIO** — Advanced circuitry and high-quality parts ensure 87dB Phono and 110dB AUX signal-to-noise.
- **NEW PEAK METER** — Easy-to-read fluorescent meter displays instant peaks over wide 60dB range for each channel.
- **POWER OUTPUT** — Continuous 65 Watts per channel, 10Hz to 20kHz at 8 ohms, 0.009% THD or less.

"NON-SWITCHING" POWER AMP

Pioneer's MAGNI-WIDE Policy Defined

The remarkable "non-switching" amplifier configuration in the power amp of the SA-7800, as explained below, has made it possible to live up to each of the 12 key points covered in our Magni-Wide amp policy. They add up to the elimination of all that stands in the way of truly excellent fidelity in actual musical reproduction. These aim at the:

- (1) Expansion of dynamic range,
- (2) Increase of power output,
- (3) Removal of switching distortion,
- (4) Lowering of noise and harmonic distortion,
- (5) Ending of intermodulation distortion,
- (6) Widening of power bandwidth,
- (7) Expansion of frequency range,
- (8) Improvement of phase,
- (9) Flattening of frequency response,
- (10) Reduction of dynamic envelope distortion,
- (11) Reduction of transient intermodulation distortion, and,
- (12) Improvement of overall dynamic characteristics.

With the new PVB (Pioneer Vari-Bias) Circuit and very advanced Super-Linear RETs at work in the "non-switching" power amp of the SA-7800, each of these factors has been optimized.

Pioneer's "Non-Switching" Output

Class-A amplifiers tend to waste up to 75% of their power supply as heat, making them terribly inefficient when asked to handle anything but relatively small voltages. For this reason, Class-A amps are normally employed only in the preamplifier circuits in audio, or in hybrid "Class-AB" power amps as explained below. In the SA-7800, Pioneer has perfected a way to take advantage of the distortion-free Class-A configuration for the power amp output.

A little background: The reason Class-A amps are typically inefficient (i.e. why they run "hot") is that their push-pull complementary output transistors are always ON, always consuming energy whether or not a signal is present for them to amplify. A bias current is constantly applied for this purpose. Class-B amps, on the other hand, are arranged so that their transistors switch on and off as waveforms appear and disappear in the input signal. This lets them run

cooler, with efficiency as high as approx. 70% under ideal conditions. But, the on/off switching of Class-B presents a major obstacle to true high fidelity performance in the form of *switching distortion* (also called "notching distortion").

Our new "non-switching" power amp ends this problem. Dramatically improved high-frequency response and higher efficiency are realized in a novel and effective way.

Far Better than "Class-AB"

Seeking a temporary solution to the Class-A/Class-B paradox, audio engineers not long ago hit on the so-called "Class-AB" configuration. When the listener required an output of more than three watts or so, he selected the Class-B function by means of a switch (more sophisticated versions provided automatic AB selection). This didn't raise the efficiency of Class-A, nor did it end the hazards to tonal quality caused by switching distortion in Class-B. It merely offered an "either/or" choice. Our new "non-switching" amp, however, is a far better solution. And here is how it works:

Pioneer Vari-Bias for Low Thermal Loss

Keeping the transistors always ON in a Class-A circuit requires, as mentioned, the application of a bias current. It allows each transistor to amplify its assigned waveform within the range above and below its quiescent operating point. That bias current is always at the center point and loss is considerable and transistor breakdown is an ever-present danger. In our new PVB or Pioneer Vari-Bias Circuit, however, the bias is controlled to prevent either output transistor from being driven below its idle current into cutoff. This is how our engineers describe the advantages of this unique device:

"We developed a very simple circuit to allow very fast response of the bias control. It effectively prevents the amplifier from generating high frequency switching distortion without affecting other performance parameters. Thermal loss is low, no more than conventional Class-B types and very small when compared with that of Class-A amps. Our new PVB enables high power output with low distortion over wide frequency ranges to exceed the performance objectives outlined in our Magni-Wide amplifier policy."

Super-Linear RETs – Two Per Channel

A matched pair of these elaborate solid-state devices is employed in each channel of the power amplifier in the SA-7800. Each one has a very high f_T or amplitude limiting frequency – ten times higher than conventional bi-polar types, in fact. In addition to their high resistance to breakdown, they feature very high linearity, still more insurance that output waveforms retain near-identical characteristics with inputs.

The designation "RET" has an interesting background. Inside each one are several hundred low-power transistors, connected in parallel. Their emitter electrodes are arranged in a ring, thus the name "Ring Emitter Transistors."

In Pioneer's advanced "non-switching" power amplifier they contribute significantly to improved high fidelity performance.



Wide-Range/Low-Distortion Power Output

Amps with twice the rated output power, but without the cool efficiency and low switching distortion of the SA-7800, cannot match these specifications, given in two ways. For purposes of examining the low THD or total harmonic distortion we quote the power delivery as **65 watts per channel, continuous, over the 10 to 20,000Hz range at 8 or 4 ohms, with no more than 0.009% THD.**

When a wide-range measurement is used, the specification reads **65 watts per channel, continuous, over the 10 to 50,000Hz range at 8 ohms, with no more than 0.02% THD (at 4 ohms it is 80 watts, 0.03% THD).** This is a more-than-adequate power output any way you look at it, and distortion/frequency range characteristics can't be bettered.

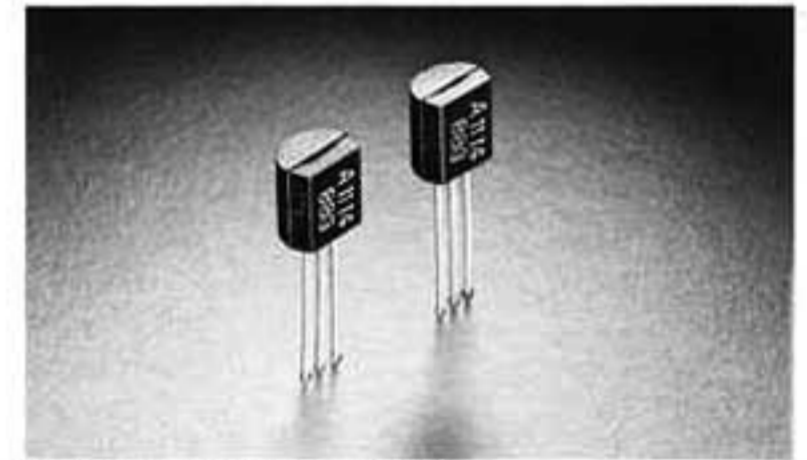
PREAMPLIFIER HIGHLIGHTS

No Phase Delay in DC Flat Amp

As in the power amplifier section, we've used a DC configuration for the flat amp in the SA-7800. Amp stages are linked without the use of phase-delaying capacitors, so no parts of the signal are "slowed down" to create problems in stereo-image definition and frequency response. Also as in all Pioneer amps, high quality parts add still other advantages. An example is the super-low-noise dual FET used in the differential input stage of the flat amp. Impedance is lowered to one-tenth that of conventional types because the input is a dual differential type. Our refined NFB or Negative Feedback design and the dual FET combine to offer a very high 110dB (AUX) signal to noise ratio here.

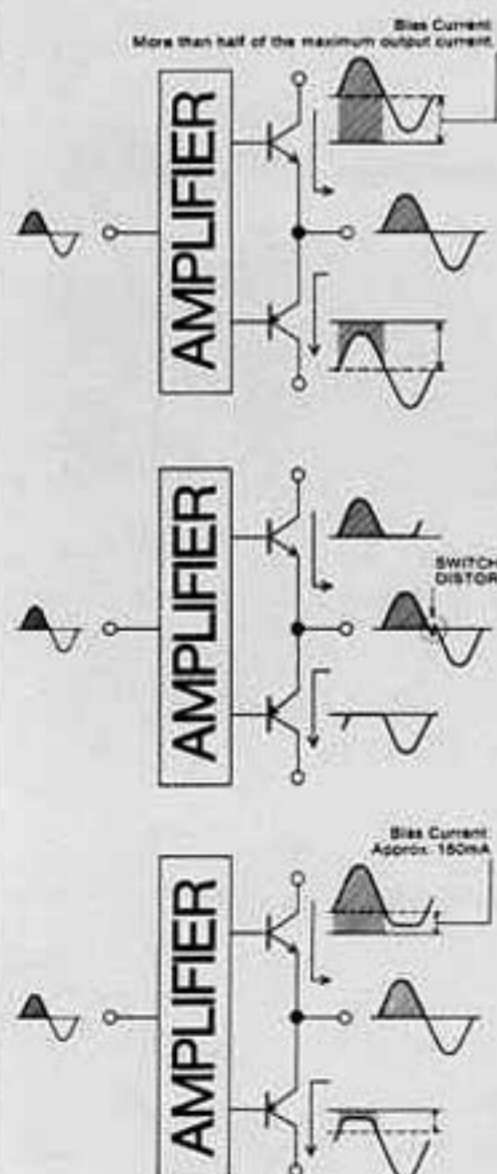
Phono Equalizer Also Low-Noise Type

Accuracy and low-distortion/low-noise performance in a phono equalizer are factors you must insist on if you wish to reproduce your records with high fidelity results. Our phono equalizer meets these requirements and more by using a three-stage direct-coupled amp with an emitter follower output. It has a super-low-noise transistor in its first stage. Signal-to-noise



Super-Low-Noise Transistors

Modes of Amplification

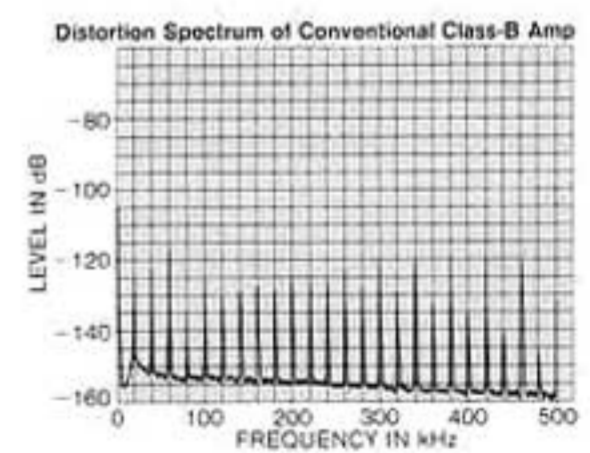
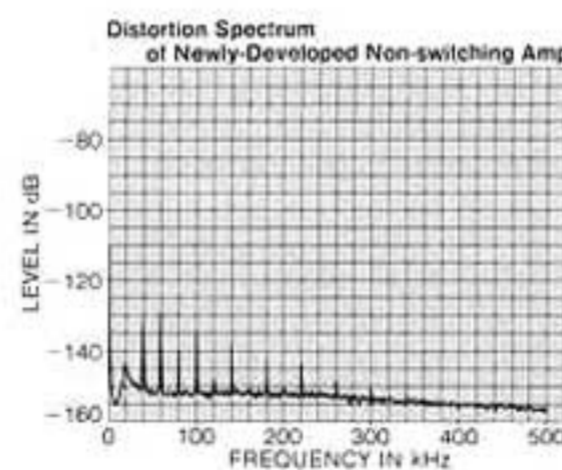


CLASS-A OPERATION
Paired transistors are always turned on, amplifying its assigned waveform within the range above and below its quiescent operating point. Therefore, no switching distortion can occur. But, that bias current is always at the center point and thermal loss is considerable.

CLASS-B OPERATION
Paired transistors alternately turn on and off, amplifying the positive half-cycles and negative half-cycles. This lets amplifiers run cooler with high efficiency. But, as the power transistors are driven below its idle current into cutoff, switching distortion (also called "notching distortion") occur.

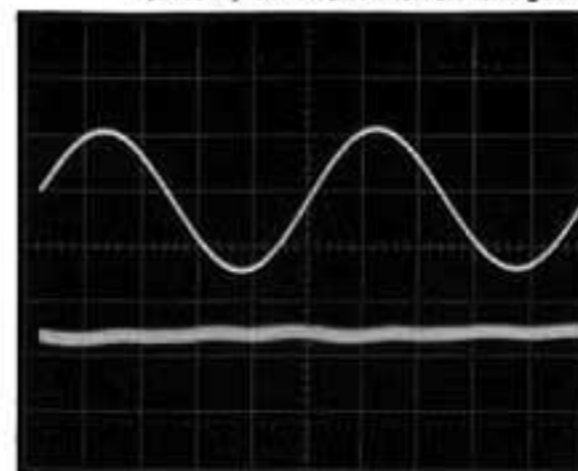
"NON-SWITCHING" AMP OPERATION
Paired transistors are always turned on; they do not switch on and off. Since the bias is controlled by our new Pioneer Vari-Bias circuit to prevent either output transistor from being driven below its idle current into cutoff, no switching distortion is generated and the thermal loss is low.

Distortion Spectra



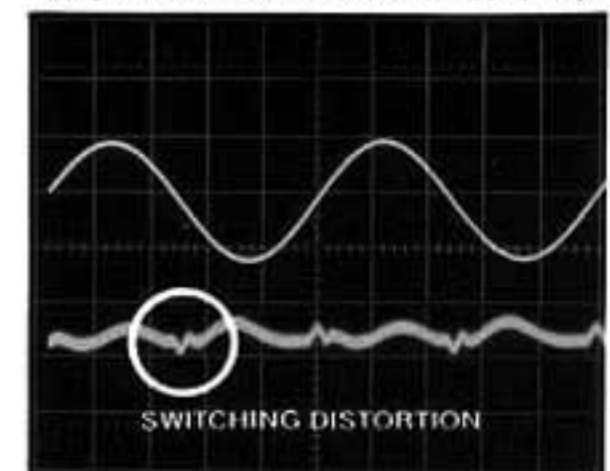
Frequency 20kHz
Fundamental frequency removed

Output Waveforms of Newly-Developed Non-switching Amp



Frequency 20kHz
Upper trace: Output voltage
Lower trace: Distortion

Output Waveforms of Conventional Class-B Amp



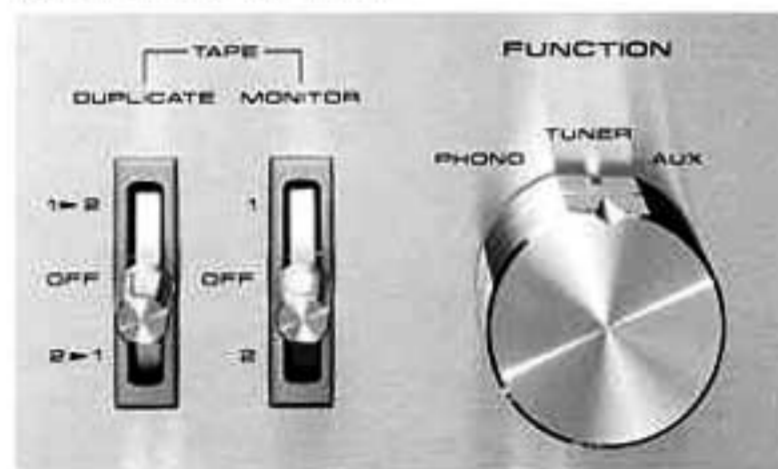
is a high 87dB, RIAA equalization is precise within $\pm 0.2\text{dB}$ (20Hz to 20kHz) with a high phono overload and very low THD.

Tone Controls & Tone Switch

The BASS/TREBLE tone controls operate from two discrete NFB circuits attached to the flat amplifier. Noise and distortion factors are significantly improved over those found in conventional Baxandall types. The rotary controls themselves are click-stopped continuous types for easier tonal tailoring to suit your acoustical environment. When the BASS control is at its "0" click, the circuit is shorted (with TREBLE at "0" its circuit is opened) to achieve an ideally flat response with improved noise characteristics. As in our more expensive integrated amplifiers, a TONE switch is provided to instantly cancel tone control settings without adjusting the settings.

Extensive Control Versatility

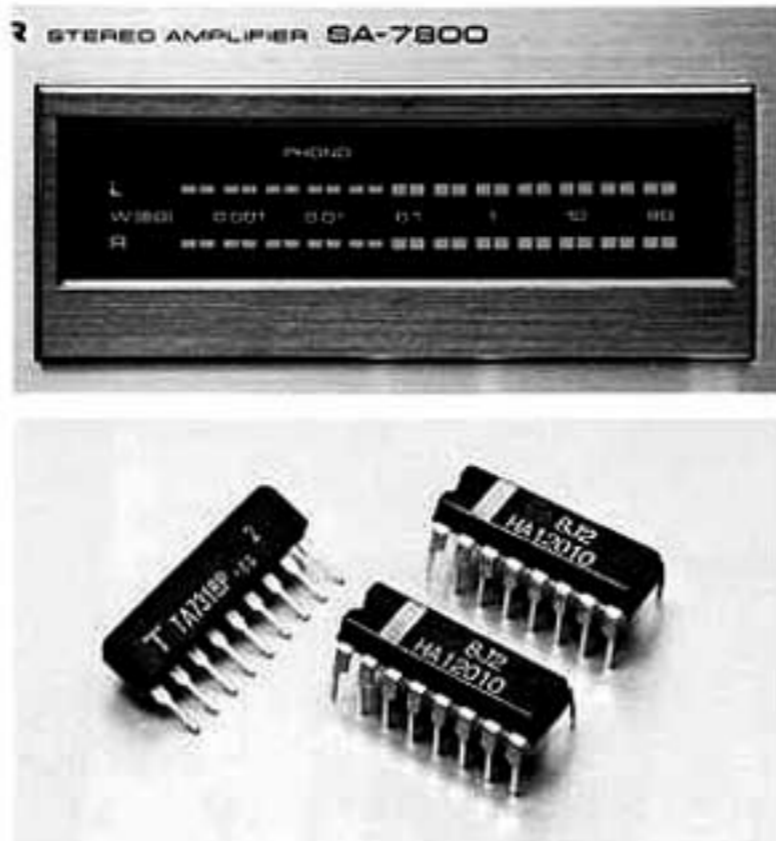
Thanks to our Magni-Wide design and "non-switching" power output, not to mention the DC configuration used in the flat amp, we've been able to retain the control conveniences other manufacturers have had to remove to ensure clean reproduction. The SA-7800 offers Loudness, Audio Muting (-20dB), a Balancer, a Subsonic Filter (15Hz, 6dB/oct.), SPEAKERS (OFF, A, B, A+B) switch and more. You will find that this amplifier makes it unnecessary to add expensive outboard units to your system because it provides all you need for recording/playback for two stereo tape decks (independent switches for MONITOR and DUPLICATE in either direction, even as you hear another source) and a MODE switch with five positions (REV, STEREO, L+R, L, R). The oversized Master Volume Control is an attenuator type with 32 precision clicks.



Fast-Response Peak Meter

Good looks and pretty color are the least of the good reasons we've chosen an elaborate fluorescent display for the peak-reading meter on the SA-7800. Durability, reliability, fast response speed, resistance to shock and changes in temperature, improved readability... all as good or better than can be found in other (analogue, LEDs, liquid crystal, etc.) types. Three new ICs are used in the meter circuitry, two to drive the display tube, the other for logarithmical compression and peak hold. The meter covers the power output range of 0.3mW to 80W in 5dB steps with 12 calibrations in each channel. The peak hold period is very short, making visual indication compatible with perceived sound level.

Combined in the display panel are lettered indicators for FUNCTION (TAPE, PHONO, TUNER and AUX). If you are monitoring a tape, the TAPE and one of the source indicators both light to indicate which source is being fed to the REC OUT terminals.



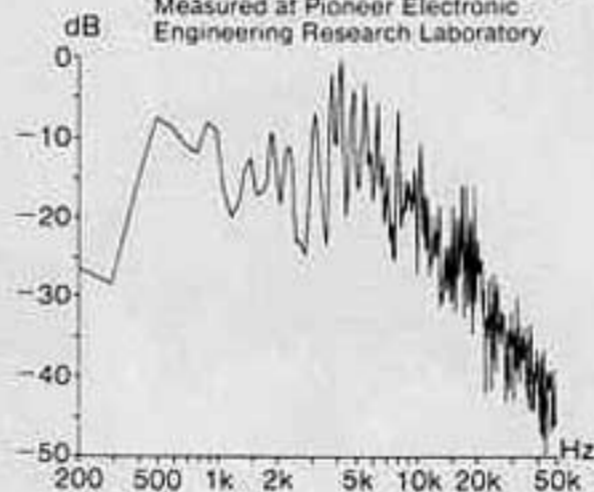
SUPERIOR CRAFTSMANSHIP

Low-Impedance Design Throughout

Recent developments have improved the performance of such program sources as direct-to-disc records and super-wide-range tapes. They now offer frequency components beyond the audible range, which means the range you do hear is reproduced with higher fidelity if your amp is up to the job. It would be a shame to sacrifice the extraordinary capabilities of the "non-switching" power amp and DC-equipped preamp of the SA-7800 to unwanted high impedance and hum caused by shoddy workmanship. This is why we've ensured the delivery of Magni-Wide performance with positive safeguards like our rugged power supply, "T-Skived" heat sinks, gold-plated protection relays and more. Ultra-high frequency distortion, "power dry-up" and high impedance are avoided entirely.

Frequency Spectrum of High-Hat Cymbal 0.35 Seconds after Being Hit

Sampled by A/D 35Kwd 12 bit 10us
Measured at Pioneer Electronic
Engineering Research Laboratory.



FETs in Power Supply

The constant-voltage power supply boards employ FETs (Field-Effect Transistors) to ensure the flow of a stable +B voltage to the flat, equalizer and first stage power amplifier. A huge power transformer and four electrolytic capacitors (each 8,000 μF connected in parallel in pairs for 16,000 μF per channel) team up to see that every circuit gets the energy it needs, when it needs it.

Gold-Plated Dual-Contact Protection

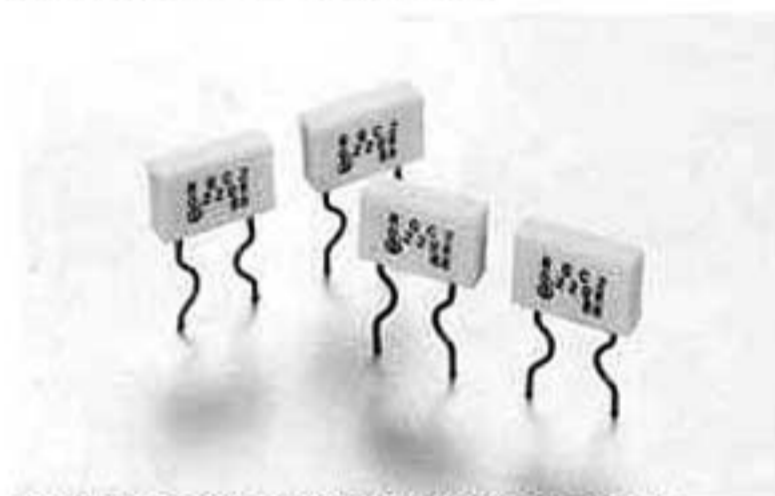
A bridge type overload detection circuit and dual-contact power relays are used in the protection circuit for reliable cut-off of speakers

and power transistors in the event of power-related mishaps. The relay contacts are gold plated to ensure full-strength signal flow for a lifetime. The circuit, by the way, serves to mute power-on/off noise.



Handcrafted Construction

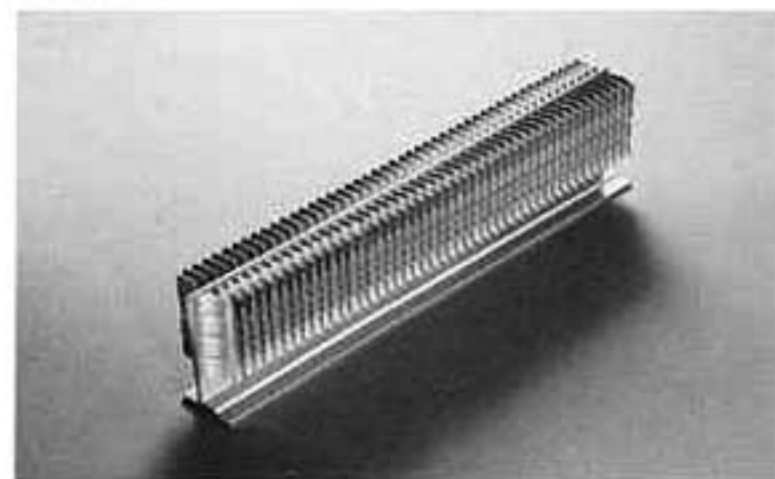
Our assembly specialists have taken particular care with the SA-7800 to avoid high impedance. Pure copper leads are provided on all power RETs and emitter resistors in the power amp to prevent the generation of induced electromotive force. High frequencies are never compromised. Pure copper is also used on the RET installation frames. "Twist-Wire" leads are found in the input signal path to reduce phono hum and in the output signal path to assure high-frequency stability. Grounding points are chosen and secured with regard for tonal quality. All in all, the handcrafted touch of the SA-7800 makes for better sound the Pioneer way.



Emitter Resistors with Pure Copper Leads

"T-Skived" Curved-Fin Heat Sink

Power amp efficiency is raised still further with the use of a "skived" (thin-sliced) design for the heat sink fins. The fins are curved, and mounted in a "T" to help reinforce the sink and the entire chassis. Weight is significantly reduced and a 50% increase in heat-dissipation is achieved.



Pioneer Extras

- PHONO INTERFERENCE FILTER — A rear-panel switch for the Phono input permits you to shut out radio and other sources of interference.
- METAL CABINET — The cabinet is in attractive black-finished metal to match other fine audio equipment from Pioneer.

A Wise Investment in The Future of Audio Performance.



SA-7800 SPECIFICATIONS

POWER AMPLIFIER SECTION

Continuous power output is 65 watts per channel, min. at 8 ohms from 10 hertz to 20,000 hertz with no more than 0.009% total harmonic distortion, or 65 watts per channel at 4 ohms from 10 hertz to 20,000 hertz with no more than 0.009% total harmonic distortion.

| | |
|--|---|
| Continuous Power Output 10Hz to 50,000Hz: | 65W+65W (T.H.D. 0.02%, 8 ohms) 80W+80W (T.H.D. 0.03%, 4 ohms) |
| Total Harmonic Distortion: (10 to 20,000Hz) | No more than 0.009% (continuous rated power output) No more than 0.007% (32.5 watts per channel power output, 8 ohms) No more than 0.007% (1 watt per channel power output, 8 ohms) |
| Intermodulation Distortion: (50Hz: 7,000Hz = 4:1) | No more than 0.003% (continuous rated power output) No more than 0.003% (32.5 watts per channel power output, 8 ohms) No more than 0.003% (1 watt per channel power output, 8 ohms) |
| Output Speaker: | A, B, A+B |
| Headphones: | Low impedance |
| Damping Factor: | 55 (20 to 20,000Hz, 8 ohms) |

PREAMPLIFIER SECTION

| | |
|-----------------------------|----------------|
| Input Sensitivity/Impedance | |
| PHONO: | 2.5mV/50k ohms |
| TUNER: | 150mV/50k ohms |
| AUX: | 150mV/50k ohms |
| TAPE PLAY 1: | 150mV/50k ohms |
| TAPE PLAY 2: | 150mV/50k ohms |

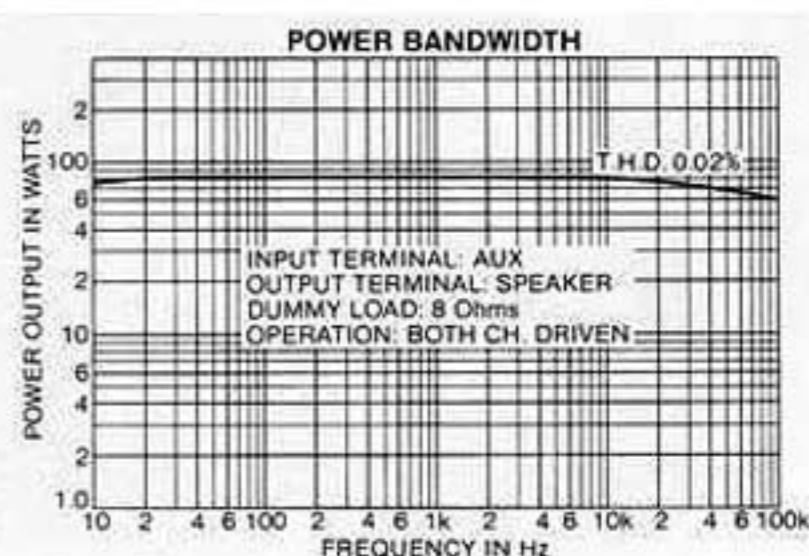
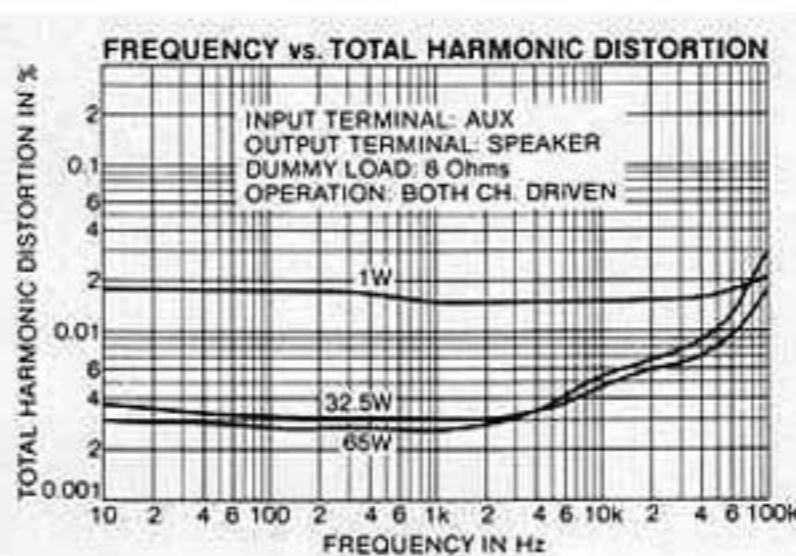
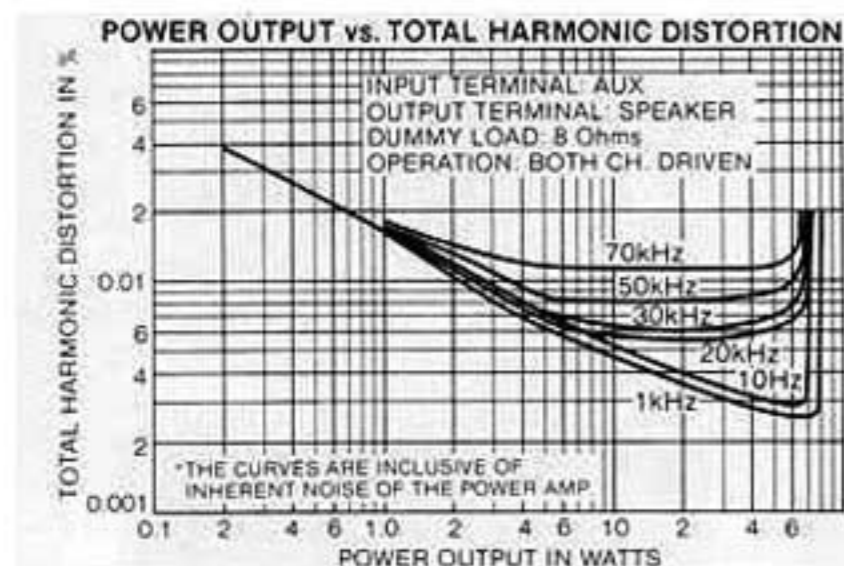
| | |
|--|-----------------------------|
| PHONO Overload Level (T.H.D. 0.003%, 1kHz) | |
| PHONO: | 200mV |
| Output Level | |
| TAPE REC 1: | 150mV |
| TAPE REC 2: | 150mV |
| Frequency Response | |
| PHONO (RIAA Equalization): | 20 to 20,000Hz \pm 0.2dB |
| TUNER, AUX, TAPE PLAY: | 5 to 100,000Hz +0dB, -1.0dB |
| Tone Control | |
| BASS: | \pm 10dB (100Hz) |
| TREBLE: | \pm 10dB (10kHz) |
| Filter | |
| SUBSONIC: | 15Hz (6dB/oct.) |
| Hum and Noise (short-circuited A network) | |
| PHONO: | 87dB |
| TUNER, AUX, TAPE PLAY: | 110dB |
| Muting: | -20dB |

SEMICONDUCTORS

| | |
|--------------|----|
| FETs: | 4 |
| ICs: | 3 |
| Transistors: | 50 |
| Diodes: | 42 |
| Other: | 1 |

MISCELLANEOUS

| | |
|---------------------|---|
| Power Requirements: | 110/120/220/240V (switchable) 50-60Hz |
| Power Consumption: | 200 watts |
| Dimensions: | Without package: 16-9/16(W) x 5-7/8(H) x 14-13/16(D) inches 420(W) x 150(H) x 376(D)mm |
| Weight: | Without package: 27 lb. 5 oz./12.4kg |



NOTE: Specifications and design subject to possible modification without notice.



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