

Equipment profiles

Threshold Stasis 3 Power Amplifier



Manufacturer's Specifications

Rated Power: 100 watts per channel, both channels driven, 20 Hz to 20 kHz, into 8-ohm loads.

Rated THD: 0.1 percent.

Rated IHF IM: 0.1 percent.

Slew Capability: 50 V/ μ S.

Output Current Capability: Instantaneous, 20 amperes; continuous,

fuse governed, 5 amperes.

Maximum Voltage Swing: 100 volts peak to peak.

Input Impedance: 75 kilohms.

Gain Factor: 26.6 dB, 1.32 volts input for rated output.

Rise Time: 3 μ S.

Damping Factor: 60, from d.c. to 20 kHz.

Hum and Noise: 103 dB, unweighted, below rated output.

Minimum Load Impedance: 4 ohms, capable of operating into fully reactive loads.

Dimensions: 19 in. (48.26 cm) W x 7½ in. (19.13 cm) H x 13½ in. (34.29 cm) D.

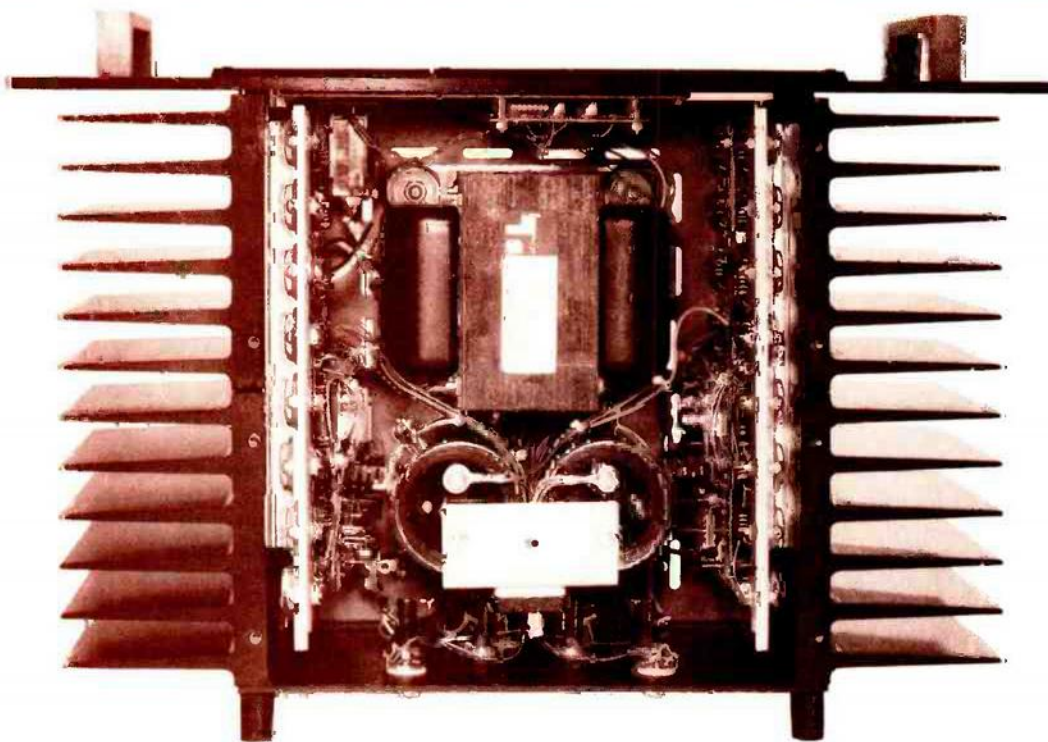
Shipping Weight: 53 lbs. (24.09 kg).

Price: \$1675.00.

With all of the variations of dynamic-biased "similar to Class A" circuits appearing in the audio marketplace from the various audio equipment manufacturing firms, one tends to forget that the idea for a dynamically biased "Class A" amplifier originated with the Threshold Corp. more than five years ago and resulted in the introduction by that company of their Model 800A in 1976. More recently, this same innovative company introduced a series of amplifiers which share the common term "Stasis," the dictionary definition of which is a form of quiescence or non-changing state. The design goal of the Stasis amplifiers was to achieve an output circuit in which the operating linearity of the transistors themselves could be improved to the point where the resulting circuit performance would eliminate the need for any overall loop negative feedback. All operational nonlinearities (distortion) in any amplifying device, such as a tube, transistor or FET, result from changing gain characteristics within the device. These, in turn, occur as a result of fluctuating voltage and current that takes place continuously as the device tries to track the frequency and changing levels of the audio signal. If a transistor could be held in an unchanging condition relative to voltage and current, it would exhibit completely linear or "perfect" operation. Unfortunately, in this condition, a

gain device would also be unable to perform any work, such as driving a loudspeaker.

The approach of Threshold in the Stasis group of amplifiers was to achieve a working system in which a nearly perfect constant-voltage, constant-current amplifier is required to do practically no work (supply virtually no power) but in which the linear-state Stasis amplifier dominates or controls the performance of a large power source. The performance of the Threshold Stasis models (including the Stasis 3 unit tested for this report) is determined by an amplifier operated under stasis conditions of suppressed voltage and current variations. It is this linear-state system which determines signal integrity and is connected directly to the loudspeaker load. This part of the circuit, however, "works" only to the extent that it is required to absorb the small nonlinearities appearing at the output of a current-mirror output stage functioning as an operational transconductance current source. Absorption occurs because of the very low output impedance of the stasis section relative to the high output impedance of the current-mirror section. Since the stasis section is highly linear, its accuracy is used as the basis for recognizing the slight deviations of the current-mirror output section that require correction.



With that somewhat lengthy circuit description out of the way, let us go on to examine the Stasis 3 amplifier itself. This is the least powerful of the three Stasis models (the Stasis 1 is a mono 200-watt amplifier, while the Stasis 2 offers 200 watts per channel in a two-channel configuration) and is nominally rated at 100 watts per channel, with both channels driven into 8-ohm loads for a rated harmonic distortion level of less than 0.1 percent at any frequency from 20 Hz to 20 kHz.

As can be seen from the photos of the unit, it is a rather hefty amplifier configured for standard 19-in. rack mounting and equipped with a pair of handles to aid in lifting its 50-lb. plus weight. Key elements of the front panel are a circuit-breaker type of on-off rocker switch at the right, along with a power-on indicator light and two vertical rows of LED peak-power-output indicators near panel center. The power indicators are calibrated from +3 dB to -40 dB, relative to the rated output of 100 watts per channel.

The physical layout of the Stasis 3 amplifier can be seen in the accompanying interior photo. Thirty-two output devices (16 per channel), each power-rated at 150 watts, consisting of extremely fast, single-diffused power transistors, make up the two output stages of the Stasis 3. The amplifier is powered by a single transformer having a power capability of 850 watts, and filtering is done by means of twin 18,000-microfarad, computer-grade electrolytic capacitors.

Two fast-blow fuses are located on the rear panel of the amplifier and are designated as "output" fuses. These are in series with the hot lead going to the loudspeaker load. Adjacent to each output fuse is a fast-blow fuse for the respective amplifier channel, and this is designated as a "rail fuse." These latter fuses are in series with the negative d.c. voltage supply of the applicable channel and are designed to disconnect the power supply from an affected channel should an abnormal stress condition occur. When the rail fuse is

opened by such a condition, the LED display of the corresponding channel will register full peak output as if the load for that channel were disconnected. An a.c. line fuse is located adjacent to the power line connector. The rear panel is equipped with two gold-plated phono-tip jacks for connection of program inputs. These inputs are electrically insulated from chassis ground. Equally isolated from chassis ground and from each other are the five-way binding posts used to connect output signals from the Stasis 3 to the loudspeaker loads. Dual banana-plug connectors are supplied with the amplifier for making speaker cable connections, but of course the wires may also be connected directly.

Measurements

The Stasis 3 power amplifier delivered 138 watts of audio power into a purely resistive 8-ohm load for its rated harmonic distortion level of 0.1 percent using an input signal frequency of 1 kHz. At the audio frequency extremes of 20 Hz and 20 kHz, power output for rated THD measured 133 and 134.5 watts respectively. The FTC rated power of this unit, therefore, would be 133 watts per channel as opposed to the 100 watts per channel rating supplied by the manufacturer. Power output versus harmonic distortion is plotted in Fig. 1 for 8-ohm operation. The amplifier was able to deliver its full rated power at its rated harmonic distortion level over a frequency range extending from 9 Hz to 40 kHz. Frequency response at nominal 1-watt output levels was flat within -1.0 dB from 5 Hz to 50 kHz and within -3 dB from 3 Hz to 87 kHz. Distortion versus frequency at rated 100 watts per channel output with both channels driven is plotted in Fig. 2. IHF Dynamic Headroom for the amplifier, driving 8-ohm loads, measured 1.4 dB referred to 100 watts per channel output.

Measurements were repeated using a 4-ohm load, and we found that the amplifier exhibited harmonic distortion levels

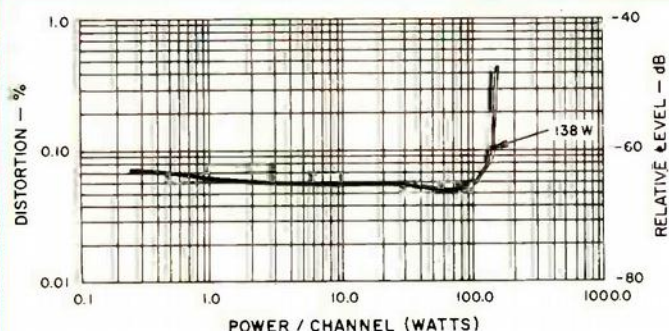


Fig. 1 — Power output vs. THD, 1 kHz, 8-ohm loads.

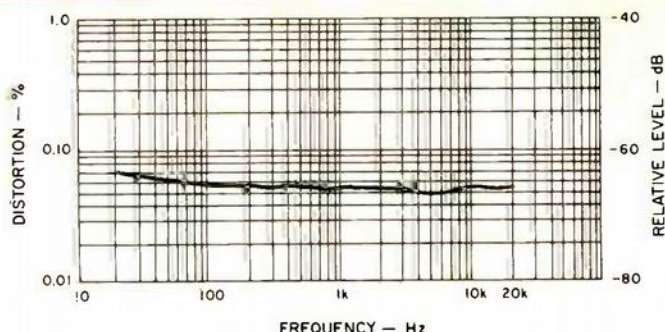


Fig. 2 — Distortion vs. frequency, which is almost constant throughout the audio band.

of 0.1 percent at around 100 watts per channel, rising slowly at 0.15 percent at 200 watts. SMPTE-IM distortion seemed a bit higher using 4-ohm loads than we had measured under the 8-ohm load condition. The amplifier was found to be unconditionally stable with reactive loads, as defined by the IHF Amplifier Measurement Standards.

IHF IM distortion, measured using the twin-tone IM method, was under 0.1 percent, as claimed, while maximum slew rate measured marginally higher than the 50 volts per microsecond claimed. Input sensitivity was 1.25 volts for 100 watts output into 8 ohm loads, and signal-to-noise ratio was 105 dB below rated output, using an "A" weighting network. Power consumption, when the amplifier delivers a constant 100 watts per channel into 8-ohm loads, measures 565 watts. We also found the LED display to be extremely accurate in terms of its dB markings relative to 100 watts output, referred to 8 ohm loads, even down to the -40 dB level.

The harmonic distortion components generated by a rated output signal driving 8-ohm loads is shown in the spectrum analysis photo of Fig. 3, using a 1-kHz reference signal. Nearly equal amounts of second- and third-order harmonic components are seen to the right of the fundamental at an amplitude of around -73 dB relative to the fundamental. If there are any higher order components, they are more than 80 dB below the fundamental. The two harmonic components visible in the display are equivalent to a total harmonic distortion of 0.031 percent, which is in good correlation with the value observed on our meter-type distortion analyzer.

Figure 4 represents a spectrum analyzer display of the fundamental and the distortion components when the Stasis 3 delivers 100 watts per channel into 4-ohm loads. The makeup of the distortion is somewhat different here, consisting primarily of third-order distortion at a level of around -65 dB relative to the fundamental 1-kHz test signal as well as some minute amounts of 5th- and 7th-order components.

Listening and Use Tests

The absence of any overall loop feedback in this amplifier imparts an immediately recognizable quality which we found to be not only extremely pleasing during the reproduction of complex music signals but also extremely accurate in its musicality. In many ways, the sound of the Stasis 3 is reminiscent of what has been described by some as "tube sound" in that it is somewhat less harsh or dry than that we associate with typical transistorized designs using high levels of overall negative feedback. It is difficult to say whether it is the conservative power rating of the amplifier or its novel "stasis" design that gave us the impression the unit is capable of delivering much more power than its nominal rating suggests. However, in our listening environment, we never ran out of audio power even when feeding digitally mastered dbx-encoded, wide-dynamic range discs to our system as a program source with which to test the power limits of this Threshold amplifier.

The amplifier does run a bit warmer to the touch, even during musical reproduction, than we would have guessed in view of the extensive amount of heat-sink area and the multiplicity of high-rated output devices, but since the amplifier did not shut down during any of our vigorous tests, we would not be too concerned about this. While the performance-determining "stasis" section of the amplifier runs in true Class A with controlled voltage regulation, the actual power-output, current-mirror source is essentially operating Class AB and therefore makes for an efficient system in terms of power consumption. We suspect, though, that at its price, potential purchasers are not going to be too concerned over a couple of hundred watts of power consumption one way or another. The real merit of this amplifier is in the sonic quality it delivers and, in certain audio realms, that's something that defies pricing.

Leonard Feldman

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Fig. 3 — Distortion components of a 1-kHz 100-watt signal into 8-ohm loads are second and third order, about 73 dB down relative to the fundamental, and total 0.031 percent.

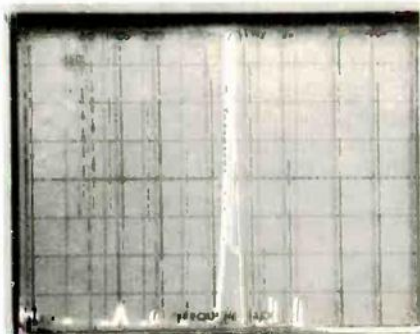


Fig. 4 — Analyzer display of 1-kHz, 100-watt signal into 4 ohms shows different distortion pattern, primarily third order at -65 dB.

