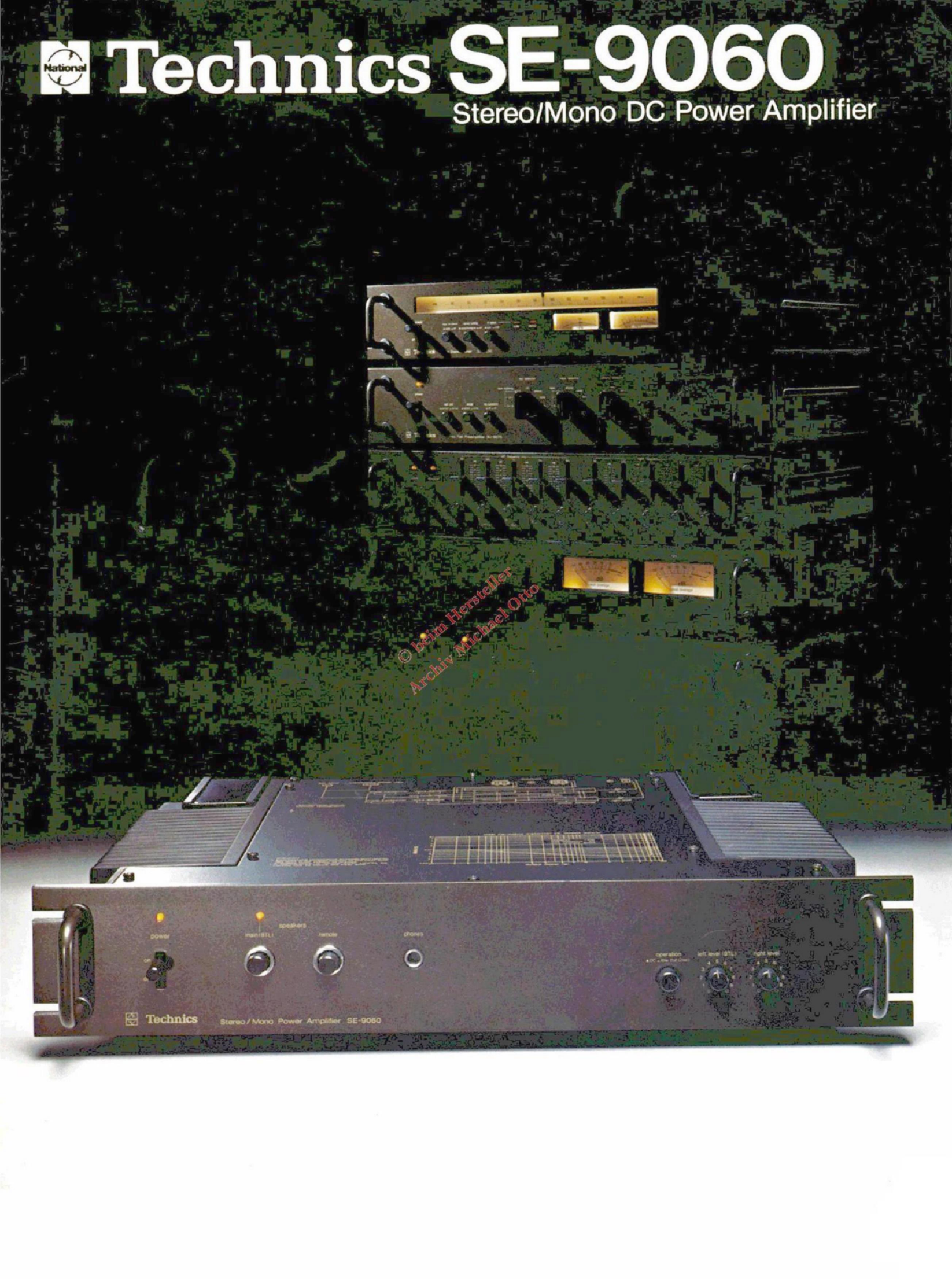
National Technics SE-9060

Stereo/Mono DC Power Amplifier



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SE-9060 Stereo/Mono DC Power Amplifier

All Stage DC Coupling in a Professional Grade Power Amp Engineered for Top Operational Stability. Capable of Stereo or Double-Power Mono Amplification.

Total Harmonic Distortion 0.02% at rated power output, and 0.0015% at half power (1kHz) S/N Ratio 120dB

The SE-9060 Solid State DC Power Amplifier Conquers New Limits

Every now and again, a spate of new electronic and technological developments results in some startling improvements in performance. The SE-9060 solid state DC power amplifier is a prime example. The T.H.D of 0.0015% at half rated power (and 0.02% at full rated power of 70W + 70W RMS across the complete audio frequency spectrum 20Hz—20kHz), and the S/N ratio of 120dB are direct results of Technics insistence upon the uncompromising standards required for ultra-clean pure sound reproduction. It almost seems that Technics has succeeded in achieving that elusive ideal of an amplifier being no more than a straight piece of wire endowed with gain properties.

In order to amplify the signals from the pre-amplifier to levels sufficient enough to drive the speakers without the slightest trace of change, not only the total harmonic distortion, but also the amplifier's "open-loop distortion" and transient distortion have all been reduced to unprecedented levels. The astronomical S/N ratio is also indicative of the unqualified success in reproducing clean, pure sound. In fact, the distortion and noise levels proved very difficult to detect and record with even advanced types of measuring equipment.

Some of the more important features in the SE-9060 include DC gain, and almost negligible phase shift in the low frequency region, made possible by the adoption of DC amplification stages. The "safety drive" protection circuits provide full protection of both speakers and amplifier unit against inadvertent speaker terminal short-circuits. Simple stereo/mono switching is also provided for use of the SE-9060 as a mono amplifier (180watts of power) in multi-amplifier set-ups, etc. Furthermore, the low, flat styling (height reduced to half that of conventional amplifiers) enhances the versatility of the SE-9060 space-wise.

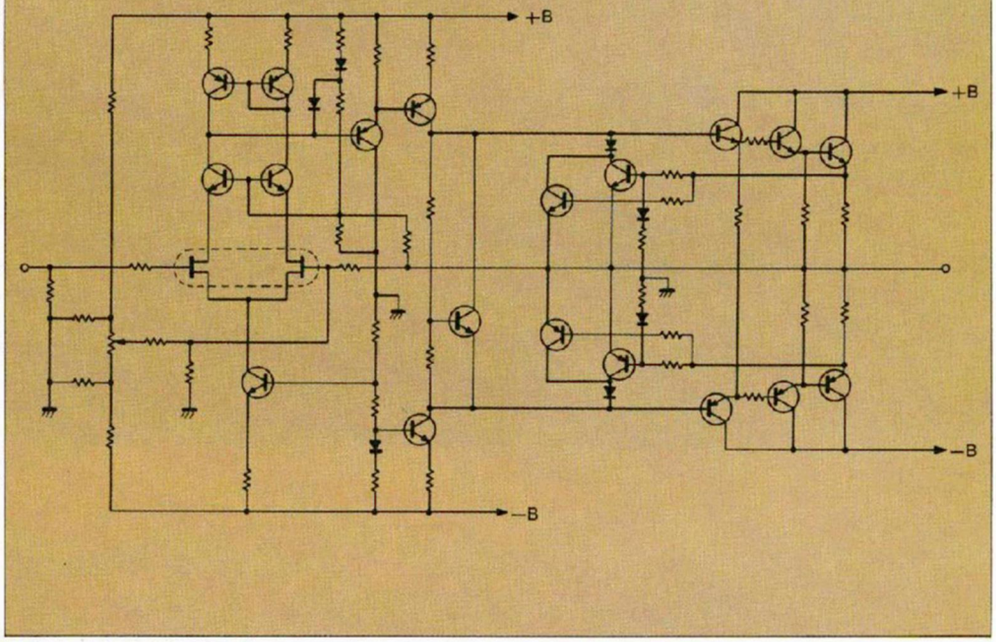
First stage: Differential Amplifier with Current Mirror Load

In the SE-9060, which employs direct-coupled OCL amplifiers in all stages, DC stability in the first stage is of the utmost importance. It is also crucial to obtain as high a gain as possible in order to suppress distortion and noise levels. The circuitry which fulfills these requirements very well indeed is the current-mirror load differential amplifier. However, it is also essential to equip this differential amplifier with the right kind of circuit components. By employing newly developed dual FETs with improved thermal characteristics in the differential amplifier, the SE-9060 is guaranteed high DC stability. High gain and low distortion are achieved by using current-mirror circuit load which provides a special variety of push-pull operation.

Voltage Amplifier Stage: Constant Current Load for Greatly Reduced Distortion

Since this stage is responsible for a majority of the signal amplification in the power amplifier, distortion tends to be generated more readily, and consequently has a greater bearing of the overall open-loop distortion level of the unit. By employing a constant current load instead of the more conventional bootstrap circuitry, and by making full effective use of current feedback, the SE-9060 successfully suppresses the generation of distortion in this stage.

Circuit Diagram

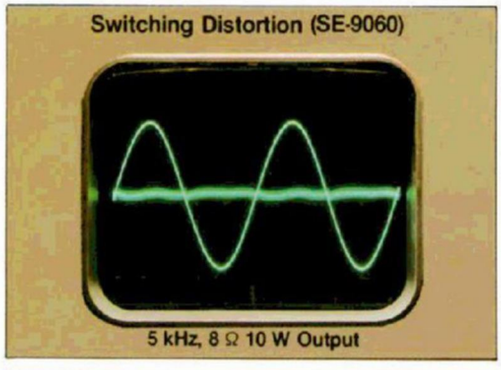


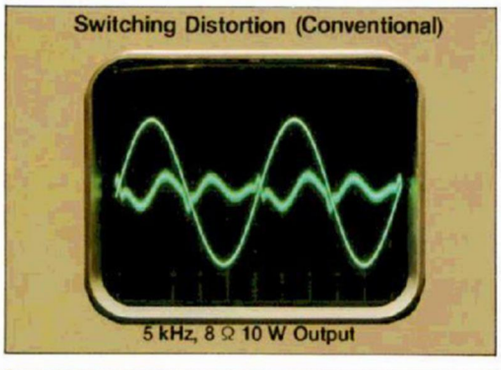
Output Stage: Pure Complementary SEPP Circuit with New 3-Stage Darlington Circuit

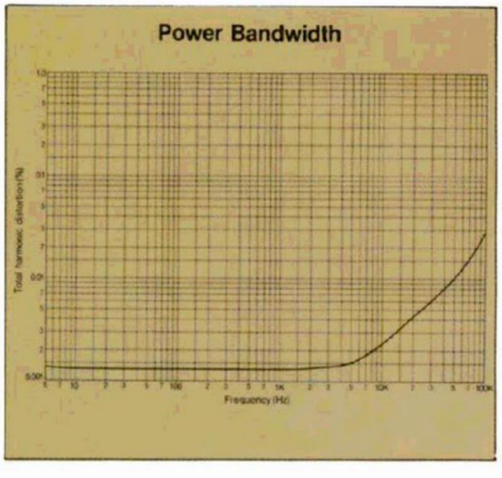
The bi-polar transistor collector-grounded operation (emitter-follower) of this high grade circuit provides exceptionally outstanding linearity, high input impedance, and low output impedance. In comparison to the earlier 2-stage Darlington circuits, the 3-stage Darlington achieves much better linearity, and reduces output impedance, thus attaining a marked increase in overall performance in the SE-9060.

Low Switching Distortion in High Frequency Region

The success in reducing distortion in all 3 major amplification stages is also due to significant suppression of switching distortion in the high frequency region. Hence total harmonic distortion from 20Hz all the way to 20kHz is reduced to an unprecedented 0.02% at full rated output power (8 ohms).







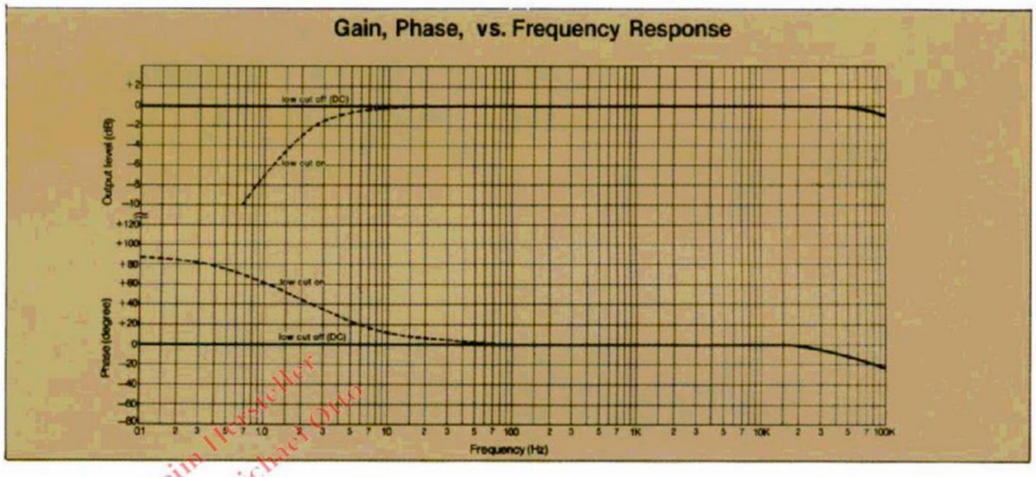
DC Amplifier for Real Improvement in Waveform Fidelity

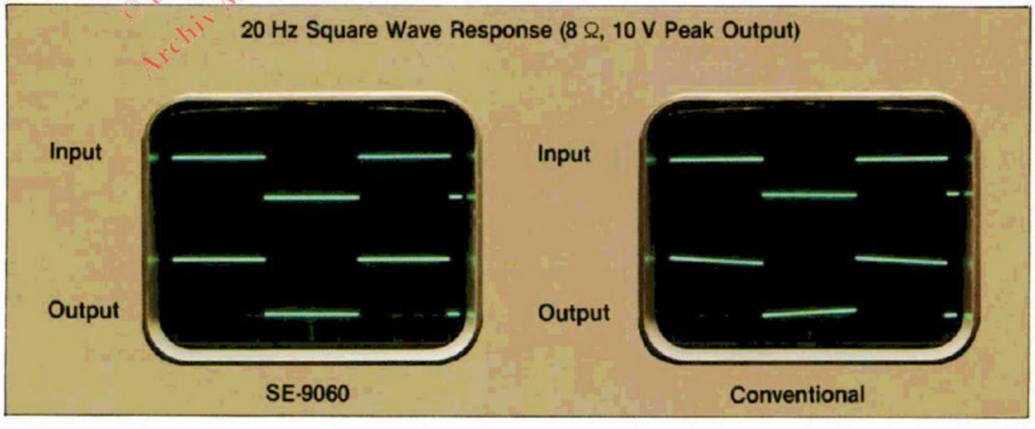
Adoption of the DC amplifier, which employs no input/output coupling capacitors, nor any time-constant capacitors between amplifier stages and in the NFB loop, has significant advantages over the more conventional non-DC amplifier. Particularly in the low frequency region, frequency response is much flatter, and phase shift is almost non-existent. These factors are instrumental in the waveform fidelity of the input signals, and contribute to the greater quality of sound.

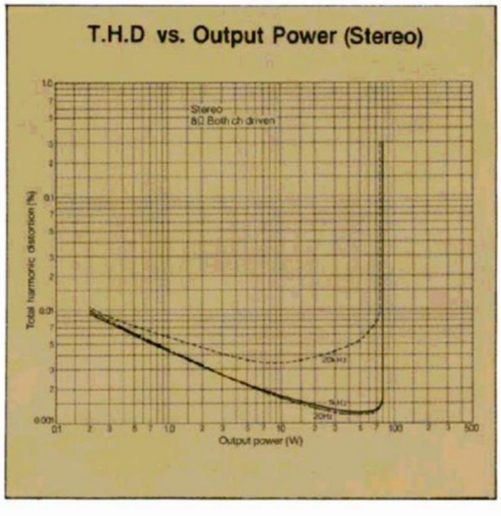
The marked improvement in performance of the SE-9060, due to the greater waveform fidelity, is clearly shown by the very exacting square wave response.

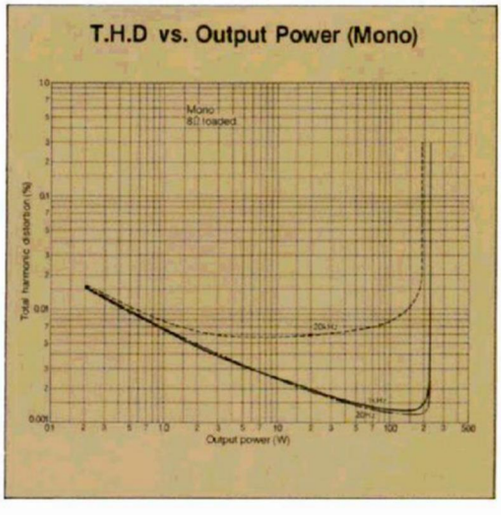
Since DC amplifiers are more susceptible to changes in ambient temperature, and power supply voltage, DC stability, particularly the stability of the DC potential on the output terminals, required very special attention. Consequently, stability in the SE-9060 has been increased to extremely high levels, largely through the effectiveness of the first stage current-mirror load and differential amplifier equipped with matched dual FET of very high thermal stability characteristics.

The SE-9060 also includes a special low-cut filter switch (2Hz) to eliminate any danger of damage to speakers due to the direct amplification of DC input components.









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Direct Mono/Stereo Switching for Doubled Output Power

The 70 watts per channel output power (0.02% THD, 8 ohms, 20Hz—20kHz) provided by the SE-9060 is certainly more than sufficient to drive most high quality high capacity speaker systems. But in order to improve dynamic range with low efficiency speaker systems, or when setting up multi-amplifier systems or other professional class systems, the SE-9060 will provide a massive 160 watts of power by simply switching over to mono. In this case, a balanced transformerless ("strapped") circuit connected to the left(L) main speaker terminal is formed. A rear panel switch is all that is required, no rewiring is involved at all.

Technics Protects Your Investment: Three Ways of Safety Drive Protection

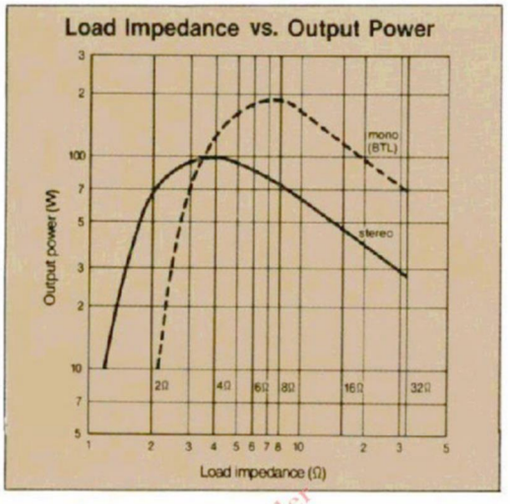
Amplifier and speaker systems represent a considerable investment that deserves, no, needs to be protected against accidental damage due to misuse or malfunction. In the SE-9060 perfect fail-safe protection is achieved by a combination of three circuit concepts.

DC potential, dangerous to loudspeakers, can conceivably occur as the result of DC drift in an upstream amp stage. In the SE-9060 a special detector circuit discovers the slightest trace of DC at the outputs and immediately activates a relay which severs the amp-to-speakers connection.

A short in the speaker leads, potentially dangerous to the amp itself, is countered by the current limiter circuit which prevents excessive current flow (and resultant damage) in the amplifier's power stage.

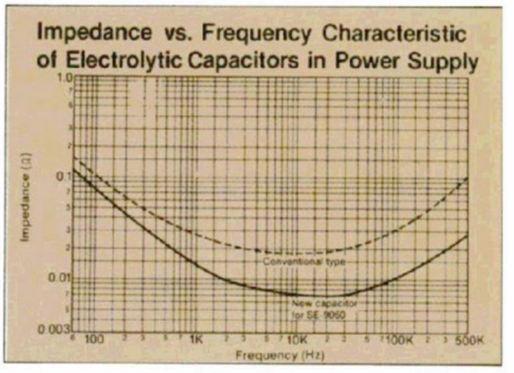
Thirdly, amplifier transistors could conceivably be damaged by too much heat caused when speaker impedance drops below the permissible limit. In such a case, an exclusive power limiter circuit restricts amplifier power within safe limits. Together, the three types of safety drive protection provide an extremely high degree of operational safety and make the amp-speaker system practically error proof.

Maximum output is obtained with a 4 ohm load during stereo, and with an 8 ohm load during mono.



Independent Power Supplies for Perfect Stability

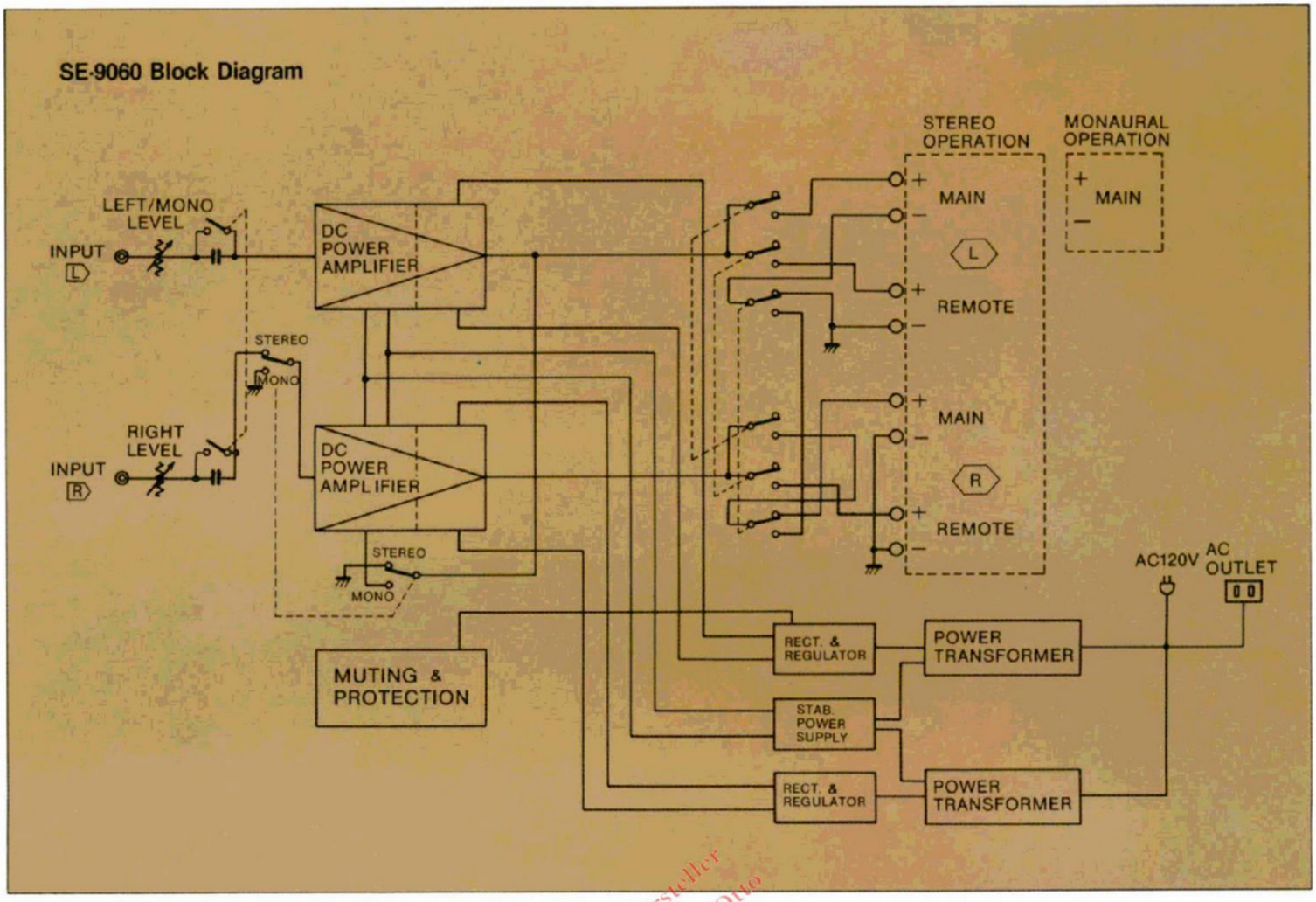
Besides the significant improvements gained in the actual amplifier stages, the SE-9060 has also been designed to eliminate any sign of transient distortion such as transient crosstalk and self-transient distortion introduced by voltage instability in the power supply. This has been achieved by the incorporation of independent transformers, electrolytic capacitors, and rectifier circuits in left and right channels, as well as constant voltage supplies for both the differential and voltage amplifier stages. The four 18,000μF electrolytic capacitors, developed especially for the SE-9060, reduce inductance and improve the high end of the frequency response. The transformers employ very heavy and very effective magnetic field shielding, consisting of copper short rings, 2 layers of silicon steel covering, and a copper ring cover.



Press-button Speaker Selectors with Switching Relay

Selection of the main and remote speaker systems connected to the SE-9060 is effected by a very simple push-button operation on the front panel. The relay employed in this speaker switching eliminates unnecessary wiring and reduces the effect of contact resistance.

SE-9060 Block Diagram



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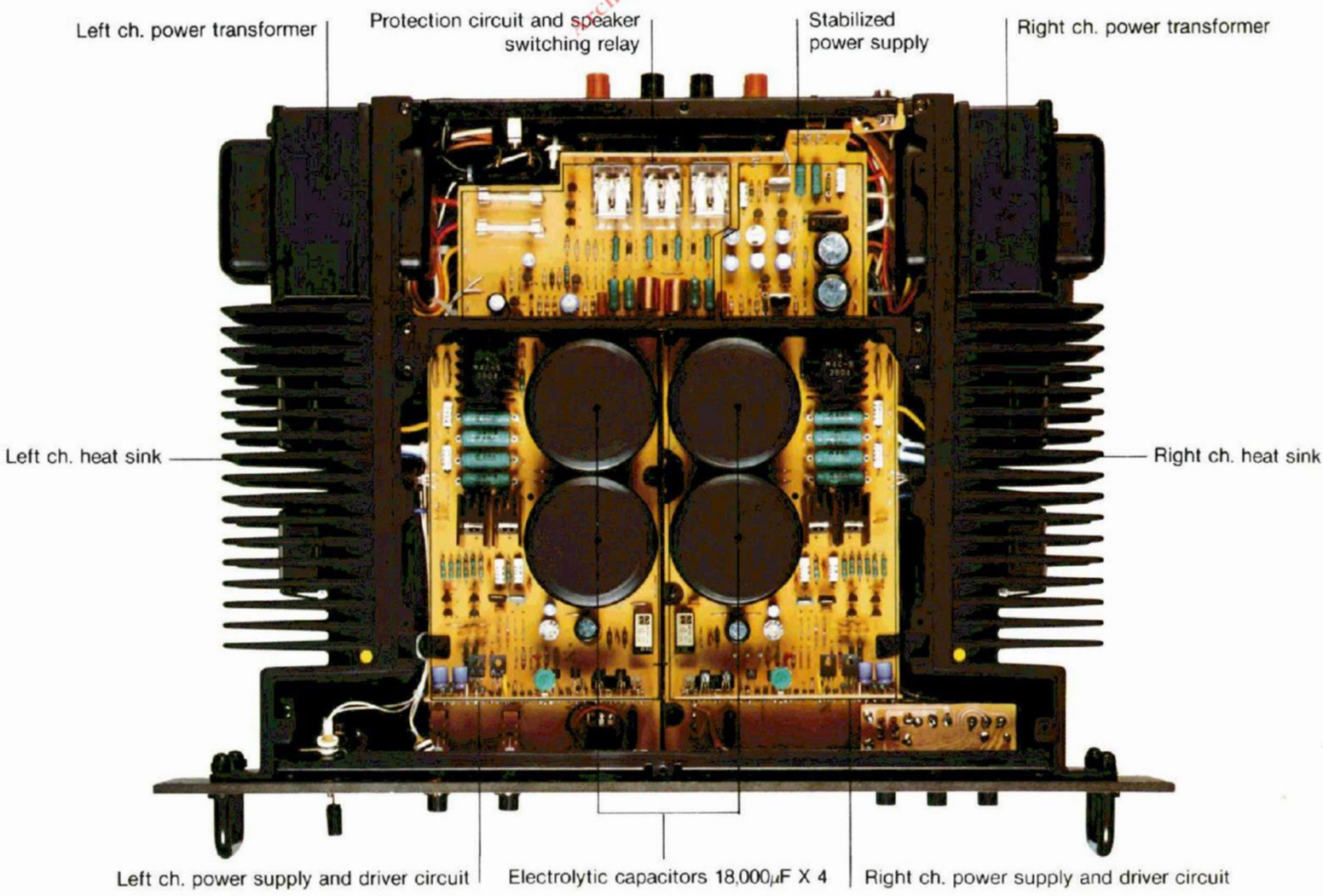

Rear Panel Facilities

1. Input terminals
2. Operation switch (stereo or mono)
3. Speaker terminals (REMOTE)
4. Speaker terminals (MAIN)

The "Flat" Component System is dedicated to ultimate performance at an affordable price.

Ultimate performance. Because in creating the "flat" system Technics engineers separated the basic amplifier/tuner into five components. Researched and developed each component to state-of-the-art perfection. Then recombined the components into a system that provides a magnitude of performance once thought to be purely theoretical. Affordable price. Because each component is priced far lower than what you'd expect, considering its extraordinary quality. And because the five-way breakup lets you buy just the equipment that you need—or can afford—right now. With the possibility of adding the rest of the system in the future.

The "Flat" Component System consists of:

ST-9030: FM Stereo Tuner
SU-9070: Stereo DC Preamplifier
SH-9010: Stereo Universal Frequency Equalizer
SH-9020: Peak/Average Meter Unit
SE-9060: Stereo/Mono DC Power Amplifier

Movable Custom Rack, Model SH-999K

Elegant custom rack for Technics "Flat" components or other 45cm units. Side panels black grain veneer, glass top and front door. Record compartment holds several dozen LP's. Four sturdy casters for mobility and easy access to back panel connections.

Dimensions (W×H×D) 540×969×400 mm

Technical Specifications

Rated minimum sine wave RMS power output
- Stereo operation
  - 20 Hz～20 kHz
  - both channels driven
  - 0.02% total harmonic distortion
    - 70 W per channel (8 ohms)
    - 90 W per channel (4 ohms)
- Monaural operation
  - 20 Hz～20 kHz
  - 0.02% total harmonic distortion
    - 180 W (8 ohms)

1 kHz continuous power output
- Stereo operation
  - both channels driven
  - 0.02% total harmonic distortion
    - 75 W per channel (8 ohms)
    - 100 W per channel (4 ohms)
- Monaural operation
  - 0.02% total harmonic distortion
    - 200 W (8 ohms)

Total harmonic distortion
- at rated power
  - (20 Hz～20 kHz) 0.02%
- at half power
  - (20 Hz～20 kHz) 0.006%
  - (1 kHz) 0.0015%

Intermodulation distortion
- at rated power
  - (60 Hz: 7 kHz, 4:1) 0.02%

Frequency response
- 20 Hz～20 kHz
  +0 dB, −0.05 dB
- DC～100 kHz
  +0 dB, −1 dB

S/N ratio (IHF, A) 120 dB

Residual hum & noise 100 μV
- 25 μV (IHF, A)

Input sensitivity and impedance 1 V/47 kΩ

Damping factor
- Stereo 100 (8 ohms) 50 (4 ohms)
- Mono 50 (4 ohms)

Load impedance
- stereo
  - main or remote 4～16 ohms
  - main + remote 8～16 ohms
- mono 8～16 ohms

GENERAL

Power consumption 240 W

Power supply 120 V or 220～240 V

Dimensions (W×H×D) 450×92×380 mm

Weight 12.0 kg

National Technics
Matsushita Electric

Specifications subject to change without notice. Printed in Japan SD7D020E