

Technics

SE-A5 SU-A6

Stereo DC Power Amplifier

Stereo DC Control Amplifier

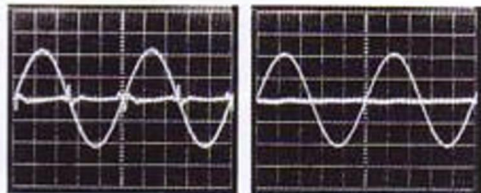


SE-A5

Stereo DC Power Amplifier

New Class A with LFB

The SE-A5 power amplifier employs Technics New Class A circuitry, a design which eliminates the switching and crossover distortion associated with conventional class B amplifiers. New Class A provides the low distortion of class A amplifiers, yet maintains the power efficiency of class B amplifiers. Although the New Class A circuitry itself results in distortion figures as low as the best amplifiers in the audio industry, Technics has gone another step beyond.



Class B amplifier output waveform and distortion waveform (at 20 kHz)

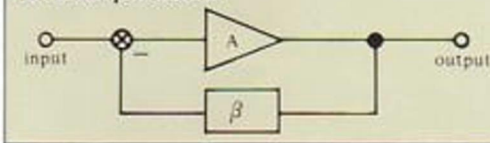
New class A amplifier output waveform and distortion waveform (at 20 kHz)

Linear Feedback

We ran an exhaustive study on the mechanisms of negative feedback (NFB). As a result of this research, we developed the new Linear Feedback (LFB) circuitry, which effectively utilizes NFB to reduce distortion. This state-of-the-art power amp has a rated output of 120 watts per channel, both channels driven from 20~20,000 Hz into 8 ohms with no more than 0.002% total harmonic distortion.

Our extensive research convinced us that NFB could indeed be used to reduce overall system distortion without introducing any distortion of its own, if NFB techniques are applied in the proper way.

NFB Amplification

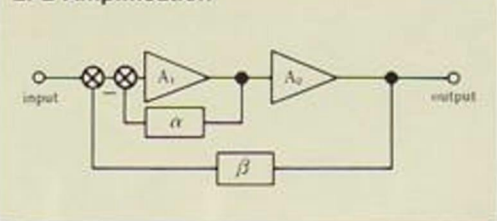


The above diagram briefly illustrates the principles of a NFB amp. Up until now, the goal has been to improve amplifier performance by increasing open loop gain (gain before NFB is applied) as much as possible without raising open loop output impedance or open loop distortion. This may be accomplished by increasing the number of amplification stages. However, as the number of stages increases, phase characteristics in the higher frequency ranges deteriorate, which limits the amplifier's stability. Past attempts to correct phase have induced TIM (transient intermodulation) and other types of distortions.

At Technics, we have reduced distortion caused by amplification stages to practically zero by using our new and unique Linear Feedback circuit. As shown in the diagram, Linear Feedback is based on the technique of applying multiple feedback loops to the various stages within the internal circuitry of the amplifier. Concisely, it includes an infinite gain amplifier within the NFB loop which approaches zero distortion and zero output impedance. As a result, all other internal problems within the amp caused by active element distortion, noise, and the effects of the power supply are minimized. Additionally, a low output impedance is equivalent to an infinite damping factor at the speaker terminals, which results in ideal speaker drive characteristics. And counter-electromotive



LFB Amplification



forces generated by the speaker system are suppressed, so induced intermodulation distortion (IIM) is not characteristic of this design.

Synchro-Bias Circuit Eliminates Crossover Distortion

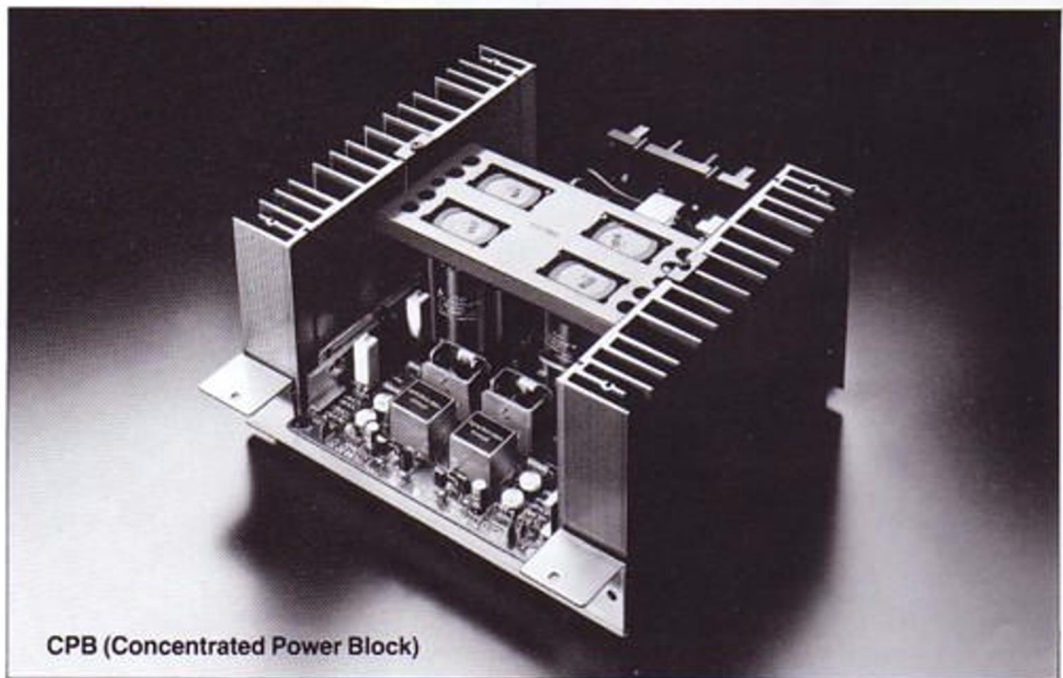
Class A amplifiers produce high-quality sound but waste a lot of power because the output transistors are biased to operate continually, and this draws a large idling current. In contrast, class B amplifiers use an "upper" and "lower" transistor section biased so that there is no idling current drawn until the transistor is "turned on" to amplify either the positive or negative half-cycle. Therefore, class B amplifiers are much more efficient, but unfortunately they also present two undesirable side-effects; switching distortion and crossover distortion. At Technics, we have eliminated both types of distortion with our original "synchro-bias" circuit. This circuit is synchronized with the input waveform, con-

stantly supplying an appropriate bias current to the power transistors so they do not turn off. This eliminates switching distortion. In the New Class A design, the synchro-bias circuit is separate from the audio signal path and employs high speed diodes for bias control. The response characteristics of these diodes show a current waveform with a rising edge which is very close to the ideal parabolic function—therefore, linearity is excellent at the crossover point, and crossover distortion is reduced to completely negligible levels.

Concentrated Power Block

Induction of electromagnetic waves traveling from the output stage and power supply, via a magnetic chassis (or some other magnetic element), can interfere with the small signal circuits; this cause of distortion is extremely difficult to overcome.

Various non-magnetic materials (including copper and plastics) have been used in chassis construction in an effort to eliminate the influence of electromagnetic waves and, consequently, high frequency distortion. But rather than devise ways of dealing with the electromagnetic wave after it had appeared, Technics settled on a method that prevents the waves from becoming a problem in the first place. It is called the Concentrated Power Block (CPB), and it functions to stop distortion caused by electromagnetic induction at the source. Thus,



the amplifier chassis and cover can be made of magnetic materials, so it can shield the amp from effects of both external electromagnetic fields and electrostatic charges; the amp may be placed side-by-side or stacked with any other audio components.

Three-Dimensional Analysis (3DA) Reveals Outstanding Performance

The SE-A5's superior performance becomes obvious when illustrated with the Technics 3DA graph (back page). This visual device was developed by Technics for use with amplifiers, and shows distortion measurements on the order of parts per million (ppm). At its rated output of 120 watts per channel, the THD of the SE-A5 is a mere 0.002% (20~20,000 Hz, 8 ohms), and remains within 0.002% even with an output as low as 250 mW. The 3DA graph also shows the extremely wide power bandwidth, 5 Hz to 100 kHz with less than 0.007% THD.

Independent Left and Right Channel Power Supplies

Obviously, rugged, heavy-duty performance is a must in power amps. The impedance of speaker systems varies from 4 to 16 ohms, nominally. And even 8 ohm speakers connected in parallel (A+B) will present a 4 ohm, so it is easy to see the importance of solid construction in power amps. To satisfy this variety of load requirements, the SE-A5 is equipped with independent power supplies for the left and right channels using four 10,000 μ F high capacity electrolytic capacitors. The powerful power supply and large heat sinks are able to sustain 160 watts per channel, both channels driven into 4 ohms from 20~20,000 Hz, with no more than 0.003% THD—performance is always outstanding, regardless of the speaker configuration (within the specified limits of the amplifier's capability).

Output Power Selector Switch

One of the special features of the SE-A5 is the output power selector switch. In the FULL position, full rated output of 120 watts per channel may be obtained. In the LIMITED position, output power is restricted to a more modest 30 watts per channel, retaining all the benefits of high power reserve, yet providing the same ultra-low distortion and excellent frequency response as in the full position. This feature allows the unit to be used at reduced power levels at night or whenever it is not possible or practical to use a full 120 watts of power (this can be a great money-saver for users who prefer to leave their amps running at all times—the idle current's power consumption is a mere 33 watts). The LIMITED position also extinguishes the meter illumination for additional power savings.

Other Features

- Fully electronic protection circuit protects the speaker systems and power amp in the unlikely event of DC potential appearing at the speaker terminals. A relay acts to protect the amplifier from a short circuit across the speaker terminals or when an extremely low impedance load is encountered.
- Large power meters give direct readings from 0.0001 W to full power. Meter response is based on BTS specifications and meter indication closely matches the VU type.
- Floating coil power transformer for low hum and low magnetic flux leakage.
- S/N ratio of 123 dB with very low residual noise.
- Current surge protection circuit. Peak current is not reached until a few seconds after power is turned on.
- Easy-to-connect speaker terminals.
- Distinctive heavy-duty die-cast panels.
- Durable, gold-plated input terminals and connectors on accessory cables.

SU-A6 Stereo DC Control Amplifier



Class A Circuitry Throughout . . . Low Noise FET Differential Inputs Eliminate Capacitors

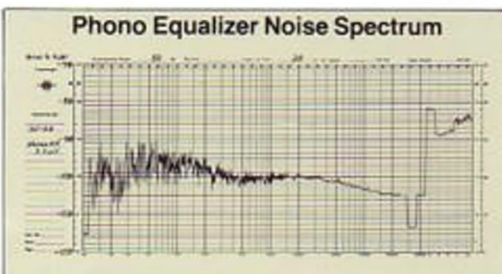
The Technics SU-A6 is a high performance preamp which can be used with any high fidelity power amplifier. It employs class A circuitry from input to output, and FET differential inputs in all stages for complete input capacitor-less (ICL) circuitry.

Basic circuitry consists of the high-gain ICL phono equalizer amp, ICL DC flat amp, and DC output amp.

Only one coupling capacitor is used (at the phono equalizer output), making this amp capable of straight DC amplification from high level inputs (tuner, aux, and tape) to output.

Parallel Low Noise FET ICL Phono Equalizer Amp

Technics SU-A6 consists of two ultra-low noise dual FET differential amps connected in parallel—these form the first stage of the phono equalizer. Thus, phono EQ is input capacitor-less for extremely low noise. The high-gain phono equalizer is capable of direct MC cartridge connection and gain is simply reduced for compatibility with MM cartridges. Phono S/N ratio is 79 dB for MM cartridges (IHF '78), and 76 dB for MC cartridges (IHF '78)—these figures offer outstanding performance for a preamp in this price range. And with an RIAA deviation of ± 0.2 dB (20~20,000 Hz), it is obvious that the SU-A6 has been designed to please the most discriminating listener. Plus, linear response is maintained all the way up to 100 kHz (± 0.5 dB). This high performance equalization means that even square wave inputs may be reproduced with a high degree of accuracy.



High-Gain FET DC Flat Amp and Single End Push Pull (SEPP) Output Amp

The flat amp and output amp are pure DC amps without a single capacitor in the signal path. When used with a DC power amplifier, the SU-A6 will allow DC amplification which extends all the way to the speaker terminals. Utilizing an SEPP output amp reduces the output impedance to an extremely low 2 ohms. Thus, the length of the power amp connection cable does not affect system performance, allowing the power amp to be placed far from the preamp. And a rated output of 2 volts is sufficient

to drive even the lowest sensitivity amplifiers with ease. The power supply consists of two sets of balanced outputs with stabilized current load, and Zener diodes with superior thermal characteristics limit DC drift to an absolute minimum.

4-Ganged Volume Control

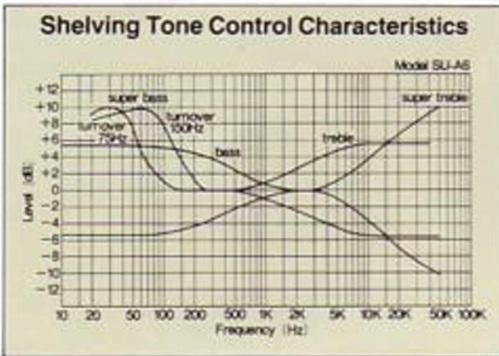
The volume control is 2-ganged for each channel (located on both sides of the flat amp) for a 4-ganged master volume control. It prevents noise when the volume is turned down and improves the overall S/N ratio.

Top Performance with All Cartridges

The SU-A6 is equipped with two phono input terminals. Phono 1 has four positions and may be used for low output MC, high output MC, low output MM, or high output MM cartridges. With a single selector switch, compatibility with any cartridge is available, eliminating any chance of a mismatch between the cartridge output and preamp input sensitivity while also providing excellent S/N ratio. MM cartridge input impedance is 47 kilohms, and 100/220 ohms for MC cartridges depending on the MC input selection.

Shelving Tone Controls

To obtain outstanding low and high frequency response with today's audio systems and source material, you may need more equalization facilities than are included on most conventional preamps. Technics' unique type of shelving tone control satisfies this requirement. It consists of steep slope Super-Bass and Super-Treble controls, plus a regular gentle sloping bass and treble configuration, covering a wide range. These four controls can be used in combination to provide a wide range of equalization characteristics. In recent years, people's taste has been leaning toward deep bass reproduction. With only a conventional bass control, many speakers have been over-compensated in the mid bass range (which results in boomy, unrealistic sound), but still poorly compensated in the deep bass region. Booniness, even if caused by poor listening room acoustics or speaker position, can be effectively controlled by attenuating the gentle sloping bass, and turning up the Super-Bass controls.



The Super-Bass circuit has a steep 12 dB/octave slope, which gives a shelving boost of up to 10 dB, thereby extending bass response by as much as one full octave. Thus, only the lowest frequency sounds are boosted, with no accompanying boominess. Super-Bass turnover frequency can be adjusted to 75 Hz for large speaker systems or to 150 Hz for small speakers. In the high range, response deviation typically is caused by the characteristics of the phono cartridge. MM cartridges often exhibit sags around 5-6 kHz and MC cartridges may have annoying high frequency peaks. By using the gentle sloping treble control and the Super-Treble control where appropriate, you can obtain flat response in almost any situation. Turnover frequency for Super-Treble is 8 kHz with up to 10 dB of adjustment available. Of course, if your system does not require any

compensation, all tone control circuitry can be switched out by turning off the VIA TONE switch. This gives you pure straight DC amplification.

Full Functions . . . Simple Design

The design of the SU-A6 is deliberately simple, reflecting the same design philosophy as the matching SE-A5 power amplifier. Only the



volume control and selector switches are located on the flat-black die-cast front panel. All other controls are hidden behind a glass door. The soft-touch button located underneath and to the right of the volume control provides access to these controls—they include all the tone controls, the subsonic filter switch, and the high-cut filter switch.

Other Features

- Remote action switches for all selectors.
- REC OUT mode selector for greater tape deck handling flexibility.
- All input/output terminals are gold plated.

Technical Specifications (DIN 45 500)

SE-A5

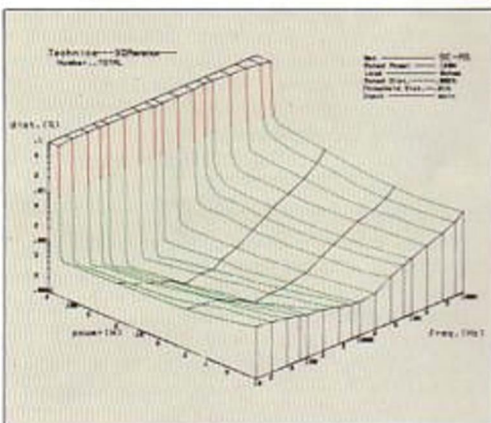
AMPLIFIER SECTION

20 Hz~20 kHz continuous power output	
both channels driven	160 W×2 (4Ω) 120 W×2 (8Ω)
40 Hz~16 kHz continuous power output	
both channels driven	160 W×2 (4Ω) 120 W×2 (8Ω)
1 kHz continuous power output	
both channels driven	180 W×2 (4Ω) 130 W×2 (8Ω)
Total harmonic distortion	
rated power at 20 Hz~20 kHz	0.003% (4Ω) 0.002% (8Ω)
rated power at 40 Hz~16 kHz	0.003% (4Ω) 0.002% (8Ω)
rated power at 1 kHz	0.003% (4Ω) 0.002% (8Ω)
half power at 20 Hz~20 kHz	0.001% (8Ω)
half power at 1 kHz	0.0005% (8Ω)
-26 dB power at 1 kHz	0.001% (4Ω)
50 mW power at 1 kHz	0.001% (4Ω)
Intermodulation distortion	
rated power at 250 Hz:8 kHz=4:1, 4Ω	0.003%

rated power at	60 Hz:7 kHz=4:1, SMPTE, 8Ω	0.002%
TIM		unmeasurably small
Power bandwidth		
both channels driven, -3 dB		
	T.H.D. 0.007% 5 Hz~100 kHz (8Ω)	
Residual hum and noise		0.1 mV
Damping factor		70 (4Ω), 140 (8Ω)
Input sensitivity and impedance		1 V/47 kΩ
S/N		108 dB (123 dB, IHF, A)
Frequency response		
	DC~20 kHz, +0 dB, -0.1 dB	
	DC~200 kHz, +0 dB, -3 dB	
Channel balance, 250 Hz~6,300 Hz		+0.5 dB
Channel separation, 1 kHz		75 dB
Headphones output level and impedance		730 mV/330Ω
Load impedance		
MAIN or REMOTE		4Ω~16Ω
MAIN and REMOTE		8Ω~16Ω
Meter		
reading range		0.0001 W~300 W (8Ω)
	-60 dB~+5 dB (logarithmic compression)	
frequency response (reading accuracy)		
	20 Hz~20 kHz ±2 dB (more than -50 dB)	
	20 Hz~20 kHz ±3 dB (less than -50 dB)	

GENERAL

Power consumption	1,000 W
Power supply	
	AC 110/120/220/240 V, 50/60 Hz
Dimensions (W×H×D)	430×178×416 mm (16-15/16"×7"×16-3/8")
Weight	18.4 kg (40.6 lb)
Note	Total harmonic distortion is measured by the digital spectrum analyzer (HP 3045 system).



SU-A6

PRE AMPLIFIER SECTION

Frequency response	
PHONO 1, 2 MM	
	RIAA standard curve ±0.2 dB
MC	
	RIAA standard curve ±0.5 dB
TUNER, AUX, TAPE	DC~200 kHz, -3 dB
	DC~20 kHz, +0 dB, -0.1 dB
Maximum output voltage	
PHONO MM	8 V (30 Hz~15 kHz)
PHONO MC	8 V (30 Hz~15 kHz)
TUNER, AUX, TAPE	8 V (30 Hz~15 kHz)
Rated output voltage	
PRE OUT	rated 2 V
REC OUT	150 mV
Total harmonic distortion (20 Hz~20 kHz)	
PHONO MM	
(phono selector: at 2.5 mV position)	
	0.002%, 0.5 V output at vol. -30 dB
	0.002%, 3 V output at vol. max.
PHONO MC	
(phono selector: at 250μV position)	
	0.006%, 0.5 V output at vol. -30 dB
	0.003%, 3 V output at vol. max.
TUNER, AUX, TAPE	
	0.002%, 0.5 V output at vol. -30 dB
	0.002%, 3 V output at vol. max.

Input sensitivity	
PHONO MM	1.0 mV, 2.5 mV
MC	100 mV, 250μV
TUNER, AUX, TAPE	150 mV
S/N (IHF, A)	
PHONO MM (2.5 mV)	
rated power	79 dB (88 dB, IHF '66)
-26 dB power	78 dB
PHONO MC (250μV)	
rated power	71 dB (74 dB, IHF '66)
-26 dB power	70 dB
TUNER, AUX, TAPE	
rated power	100 dB (106 dB, IHF '66)
-26 dB power	86 dB
Maximum input voltage	
PHONO 1, 2 MM (2.5 mV)	160 mV, 1 kHz
MC (250μV)	16 mV, 1 kHz
Input impedance	
PHONO MM (2.5 mV/1 mV)	47 kilohms
MC (100μV/250μV)	100/220 ohms
TUNER, AUX, TAPE	47 kilohms
Tone controls	
SUPER BASS	20 Hz, +10 dB~-0 dB
BASS	50 Hz, +5 dB~-5 dB
TREBLE	20 kHz, +5 dB~-5 dB
SUPER TREBLE	50 kHz, +10 dB~-10 dB

Turnover frequency	
SUPER BASS	75 Hz, 150 Hz
BASS	500 Hz
TREBLE	2 kHz
SUPER TREBLE	8 kHz
Subsonic filter	20 Hz, -12 dB/oct.
High filter	7 kHz, -6 dB/oct.
Loudness control (volume at -30 dB)	
	50 Hz, +7 dB
Muting	-20 dB
Output impedance	
OUTPUT	2 ohms
REC OUT	600 ohms
Channel balance	
Aux 250 Hz~6,300 Hz	±1 dB
Channel separation	
Aux 1 kHz	56 dB
GENERAL	
Power consumption	10 W
Power supply	
	AC 110/120/220/240 V, 50/60 Hz
Dimensions (W×H×D)	430×97×360 mm (16-15/16"×3-13/16"×14-3/16")
Weight	5.5 kg (12 lb)

Technics
Matsushita Electric