

Technics

The science of sound

SE-M100

Digital Direct Drive Power Amplifier

SU-A40

Stereo Preamplifier



SE-M100

Digital Direct Drive Power Amplifier

1. Digital Direct Drive with Unity Gain Power Amp Circuit for an Improved S/N Ratio.
2. Built-in 4-DAC, Linear 20-Bit, 8-Times Oversampling Digital-to-Analog Converter (DAC) System Helps Improve Low-Level Signal Reproduction.
3. Twin-Mono Construction Helps Minimize Crosstalk Between Left and Right Stereo Channels.

The Technics Approach to Digital Amp Quality

The advanced circuit configuration represented by the Technics Digital Direct Drive System is designed to achieve an outstanding level of performance from digital sources by bringing out the full potential of the advanced built-in DAC system.

First, the CD player's digital output signal goes directly to the power amp and thereby preserves the signal's integrity. Then, the unity gain power amp circuit — which has a zero dB voltage amplification — employs Technics' innovative Class AA technology, so it can keep the signal-to-noise ratio equal to that of the CD player itself, at all volume settings.

Full CD Dynamic Range Cannot Be Obtained if the Amp's Signal-to-Noise Ratio is Below the CD Player's

The amplifier's signal-to-noise ratio has always been better than that of analog sources, so it was never considered a problem. However, the introduction of digital sources like the CD has forced a reappraisal of this attitude. Obviously, an amp with a lower signal-to-noise ratio than the source will not be able to bring out the full dynamic range. (See figure 1)

Two major factors that contribute to a poor amplifier signal-to-noise ratio are the following:

Amplifier Circuit Noise is Amplified to the Same Degree as the Desired Signal

Typically, a preamp provides about 15dB of voltage amplification followed by 30dB applied by the power amp. Therefore, amplifier noise generated at the input stage will be subject to about 45dB voltage amplification by the time it reaches the output. This is a reason why the signal-to-noise ratio of many previous integrated digital amps was limited to only about 106dB*.

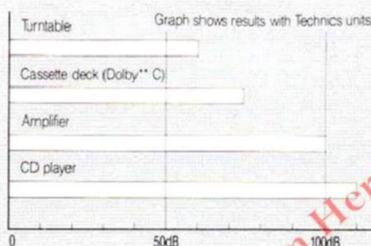
This figure can be raised to about 120dB* by direct input to the power amp, to help avoid noise amplification introduced by the preamp.

* IHF 1966

signal-to-noise ratio is expressed as the ratio of its effective output to its residual noise level. The residual noise level does not change when you change the volume control, but when you turn down the volume you do lower the output. As a result, the signal-to-noise ratio deteriorates. For example, if we connect a CD player directly to a 100W power amp with a signal-to-noise ratio of 120 and turn down the volume to reduce output to 1W, then the signal-to-noise ratio will fall to 100dB, which is below that of the CD player. This is another reason why the amplifier signal-to-noise ratio is important for accurate digital source reproduction.

The Signal-to-Noise Ratio Drops When the Volume is Turned Down

The problem here is that an amp's

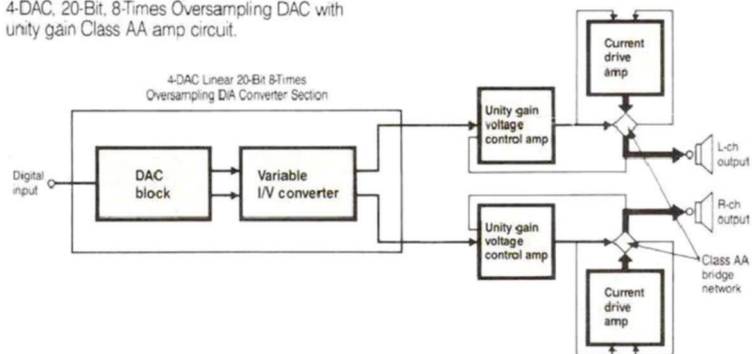


(Figure 1: S/N Comparison)

A conventional amp has a lower signal-to-noise ratio than the CD player; this prevents the reproduction of the full dynamic range of digital sources.



(Figure 2: Digital Direct Drive system block diagram)
4-DAC, 20-Bit, 8-Times Oversampling DAC with unity gain Class AA amp circuit.



Technics' Answer to this Problem is Digital Direct Drive — Using a Unity Gain Power Amp

Technics' answer is to create a power amp that does not amplify voltage. The resulting unity gain (0dB) circuit design only amplifies power. Since it does not amplify signal voltage, it does not increase the noise level. Instead, it performs the requisite power amp task of supplying sufficient current to drive the speakers.

The key to the design of this advanced circuit configuration is the separation of the voltage control from the current supply — a principle borrowed from Technics Class AA amplifiers.

In short, Digital Direct Drive achieves the same voltage at the DAC output as it does at the speaker terminals. The DAC output signal goes directly to the unity gain (0dB amplification) Class AA power amp section. The volume can be changed by adjusting the conversion factor of a high voltage I/V converter at the DAC's output stage. (See figure 2)

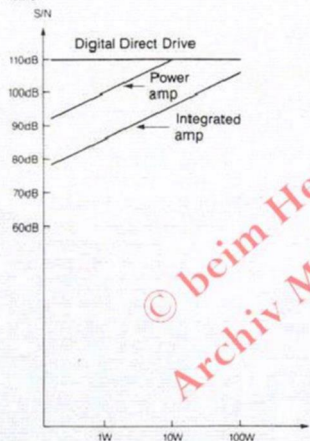
Outstanding Performance Especially with Low-Level Signals

The unity gain amp circuit does not amplify noise, so the high quality DAC output is transferred to the speakers. Regardless of the volume level setting, the amp assures a signal-to-noise ratio of 112dB*, which is higher than a typical CD player's signal-to-noise ratio. (See figure 3)

* IHF 1966

(Figure 3: Signal-to-noise ratio vs. Output level)

In the Digital Direct Drive system, volume adjustment has no impact on the signal-to-noise ratio.



The result is that this system is capable of delivering the decay characteristics of solo piano as well as the subtleties of hall ambience.

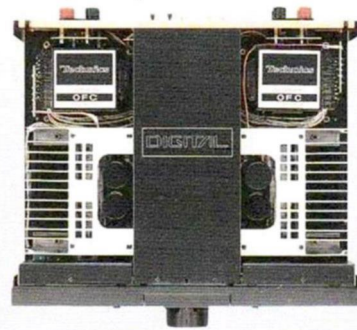
The 4-DAC, Linear 20-Bit, 8-Times Oversampling DAC System Helps Improve Low-Level Signal Reproduction

Conventional technology has not been up to the task of reproducing the low-level signal components that are present in digital sources. But this amp's DAC section is hardly conventional. It uses our 4-DAC, Linear 20-Bit, 8-Times Oversampling system — with 4 digital-to-analog converters, one each for the positive and negative sides of the left and right channels. This effectively reduces zero-cross distortion, while 20-bit high resolution operation, 8-times oversampling high-performance digital filtering, and sample/hold noise suppression further improve low-level signal reproduction.

Twin Mono Construction Helps Minimize Crosstalk

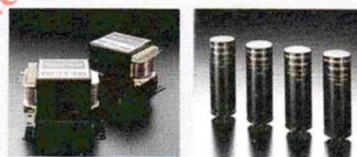
Amplifier sound cannot be improved by circuit design alone; it also requires attention to the quality of construction. In this implementation, Technics uses twin mono construction with separate left and right channel power amps on either side of the carefully shielded DAC system, which is located in the center.

In addition, an abundant use of copper-plated parts helps suppress electromagnetic distortion. Even the heat sink fins are mounted on a rubber base to help prevent microphonic problems from vibration.



Carefully Chosen Electronic Components

• Completely independent left and right channel power supply transformers with OFC windings for outstanding regulation. Thick 1.6mm plate transformer chassis with rubber insulation.



- High-speed EX capacitors with electrolyte developed for high purity. Electrodes are produced by low magnification etching with highly uniform thickness, as well as a new method of forming the dielectric film.
- Newly developed low distortion volume control.
- High-purity OCC wire used in all critical applications.
- A+B wired speaker selector.

Optical and Coaxial Direct Digital Inputs

There are two optical connectors and one coaxial connector for direct input of digital signals. You also have digital coaxial input/output facilities for a DAT deck or other digital device. Both variable and fixed analog inputs (one stereo pair each) are provided for conventional source input. If you use the variable input for connection of a component that has only analog

output, then the SE-M100's volume control can be used to adjust the level. (The volume control also works with the digital inputs.) The fixed input is intended for use with the matching SU-A40, which has its own volume control.

Technical Specifications (IHF '78)

Rated minimum sine wave RMS power output 20Hz ~ 20kHz	both channels driven	115W x 2 (0.005% THD, 8 ohms)
20Hz ~ 20kHz both channels driven		150W x 2 (0.007% THD, 4 ohms)
1kHz continuous power output	both channels driven	115W x 2 (0.0007% THD, 8 ohms)
		150W x 2 (0.002% THD, 4 ohms)
Total harmonic distortion	rated power at 20Hz ~ 20kHz	0.005% (8 ohms)
		0.007% (4 ohms)
rated power at 1kHz		0.0007% (8 ohms)
		0.002% (4 ohms)
half power at 20Hz ~ 20kHz		0.003% (8 ohms)
half power at 1kHz		0.0007% (8 ohms)
SMPTC intermodulation distortion (rated power)		
50Hz : 7kHz = 4:1		0.007% (8 ohms)
Residual hum & noise		0.45mV
Damping factor		110 (8 ohms)
		55 (4 ohms)
Dynamic headroom		1.0dB (8 ohms)
		1.4dB (4 ohms)
Load impedance		
A or B/bi-wiring		4 ~ 16 ohms
A and B		8 ~ 16 ohms
Input sensitivity/impedance		
fixed/variable		100mV (1V, IHF '66)/18 kilohms

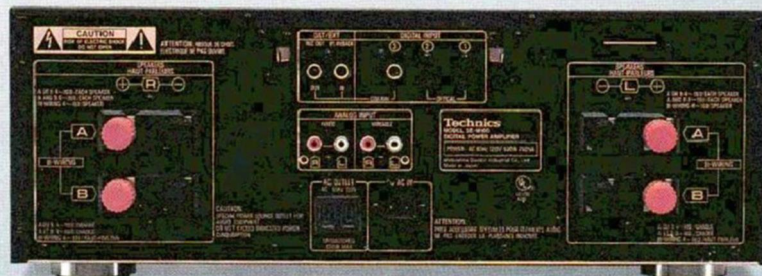
S/N	fixed/variable	98dB (120dB, IHF '66)
Frequency response	fixed/variable	0.8Hz ~ 120kHz (−3dB) +0dB, −0.2dB (20Hz ~ 20kHz)
Channel balance	(250Hz ~ 6.3kHz)	±1dB
Channel separation (1kHz)		70dB
DIGITAL SECTION		
Total harmonic distortion	(1kHz)	0.005% (EIAJ)
S/N		112dB (EIAJ)
Dynamic range		100dB (EIAJ)
Frequency response		2Hz ~ 20kHz +0.3dB, −0.3dB

GENERAL

Power consumption	750VA, 600W
Power supply	60Hz, 120V
Dimensions (W x H x D)	16 15/16" x 6 11/32" x 15 7/8" (430 x 161 x 403mm)
Weight	36.3 lb (16.5kg)

Note: Total harmonic distortion is measured by the digital spectrum analyzer.

** "Dolby" and the double-D symbol  are trademarks of Dolby Laboratories Licensing Corporation.



SU-A40

Stereo Preamplifier

1. Class AA phono EQ amp and output amp circuits.
2. High-Speed EX capacitors with high-purity electrolyte.
3. Active Servo Power Supply for high stability.

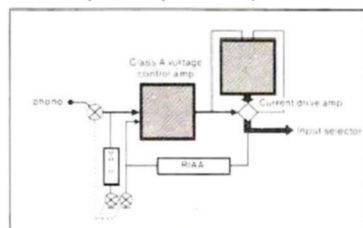
Designed as a match for the SE-M100 Digital Direct Drive Power Amplifier, this advanced preamp features Class AA phono EQ and output circuitry, high-speed EX capacitors, and an Active Servo Power Supply. It connects directly to the fixed input facilities of the SE-M100.

Class AA Phono EQ and Output Amp Circuits

LPs benefit from amplification by the SU-A40. Its phono EQ amp features Class AA construction for voltage amplification, reducing influence from RIAA network impedance fluctuations. Low-noise FETs and high slew rate circuitry provide a signal-to-noise ratio of 79dB for MM and 74dB for MC cartridges, while dropping distortion to 0.009% (MM, 20Hz to 20kHz).

The Class AA output amp helps avoid distortion caused by the input impedance of the connected power amp and the connection cord. The result is a step up in excellence for all sources, digital and analog.

Class AA phono equalizer amp

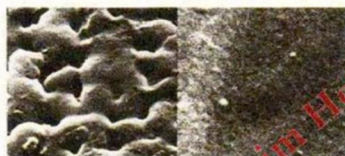


High-Speed EX Capacitors

An electrolytic capacitor has two electrodes separated by an electrolyte. In a conventional capacitor, additives are needed to prevent the electrolyte from corroding the oxide coating that protects the positive electrode (anode). But these additives also cause distortion. Now, biotechnology creates an electrolyte that is purer, allowing a more uniform oxide layer without sound-muddying additives. These capacitors help bring out the full potential of Class AA amplification.



Capacitor's aluminum film surface comparison (Electron micrograph)



Conventional type High speed EX capacitor

Active Servo Power Supply

Noise and voltage stability are particularly important considerations in a preamp's power supply because of the low-level signals being handled. The SU-A40 uses a feedback circuit comprised of a special stabilized voltage IC with excellent thermal characteristics and a wide band IC with outstanding high frequency characteristics. This Active Servo Power Supply maintains excellent regulation and low noise throughout the audio frequency range.



SU-A40 rear panel

OCC/OFC Wiring

The SU-A40 is designed for high signal purity. The OCC/OFC wires contribute to outstanding performance in every section of the circuitry — from parts leads to interconnecting wires between stages. Consistent conductivity across the frequency spectrum can mean more striking sonics.

More Valuable Features

- 6-Position Input Selector and Separate Record Selector.



- Tape 3 Monitor/EXT Selector. Allows connection of a third tape deck or graphic equalizer.
- MM/MC Phono Selector.
- Tone Defeat Switch.
- Subsonic Filter Switch.
- Loudness Switch.
- Stereo/Mono Switch.
- Muting Switch.

Technical Specifications (IHF '78)

Total harmonic distortion	
phono MM 20Hz ~ 20kHz	0.009% (IHF '78)
	0.004% (2V output at vol. max)
phono MC 20Hz ~ 20kHz	0.01% (IHF '78)
	0.005% (2V output at vol. max)
tuner, CD, aux, tape 1,	
tape 2/DAT, tape 3/ext	0.006% (IHF '78)
	0.003% (2V output at vol. max)

Input sensitivity/impedance	
phono MM	1.25mV (2.5mV, IHF '66)/ 47 kilohms
MC	85µV (170µV, IHF '66)/ 220 ohms
tuner, CD, aux, tape 1, tape 2/ DAT, tape 3/ext	75mV (150mV, IHF '66)/ 18 kilohms
Phono maximum input voltage	
MM	150mV (170mV, IHF '66)
MC	10mV (12mV, IHF '66)
S/N	
phono MM	79dB (88dB, IHF '66)
MC	74dB (72dB, IHF '66)
tuner, CD, aux, tape 1, tape 2/ DAT, tape 3/ext	91dB (106dB, IHF '66)
Frequency response	
phono	RIAA standard curve ±0.2dB (30Hz ~ 15kHz)
tuner, CD, aux, tape 1, tape 2/ DAT, tape 3/ext	0.8Hz ~ 150kHz (−3dB) +0dB, −0.1dB (20Hz ~ 20kHz)
Tone controls	
bass	50Hz, +10dB, −10dB
treble	20kHz, +10dB, −10dB
Muting	−20dB
Subsonic filter	20Hz, −6dB/oct
Loudness control (volume at −30dB)	50Hz, +9dB
Output voltage	
tape 1, tape 2/DAT, tape 3/ext REC OUT	150mV
PRE OUT rated	1V
maximum	8V
Channel balance	
(aux, 250Hz ~ 6.3kHz)	±1dB
Channel separation (aux, 1kHz)	50dB
GENERAL	
Power consumption	8W
Power supply	60Hz, 120V
Dimensions (W x H x D)	16 ¹⁵ / ₁₆ " x 4 ¹ / ₁₆ " x 11 ¹⁵ / ₁₆ " (430 x 103 x 290mm)
Weight	8.8 lb (4.0kg)
Note: Total harmonic distortion is measured by the digital spectrum analyzer.	

Technics

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