Technics SA-1000

FM/AM Stereo Receiver
Total Performance Series

330 watts per channel

minimum continuous "RMS" into 4 or 8 ohms, both channels driven, from 20–20,000 Hz, with no more than 0.03% total harmonic distortion.

Tremendous, Y
in a Purist

With the ability to deliver 330 watts per channel at distortion levels far below audibility, the SA-1000 is more powerful than the majority of separate power amps now available.

In a practical audio system, do you really need all this power? Let's put it this way— if you occasionally like to listen at volume levels that make you feel "right there" at a live musical performance, you'll appreciate the SA-1000's enormous power capabilities. Because it can deliver the dynamic impact of a massive symphonic orchestra, a big jazz band, or a heavy-metal rock group. Under conditions that would make lesser-powered units clip noticeably, the SA-1000 will continue to sound smooth, clean and unstrained.

But even if high power isn't a requirement for you, the SA-1000 has a host of other qualities to recommend it to the purist. Because Technics engineers took a purist's approach from the start. They backed up enormous power with equally superb performance in *all* areas.

et Clean Power
t's Receiver

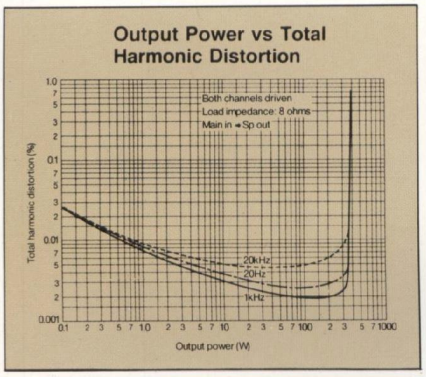
The phono equalizer stage provides the widest dynamic range ever in a Technics receiver. Not only is it extremely quiet; it will also handle the high voltages that can be generated by very dynamic records such as the new direct-to-disc types.

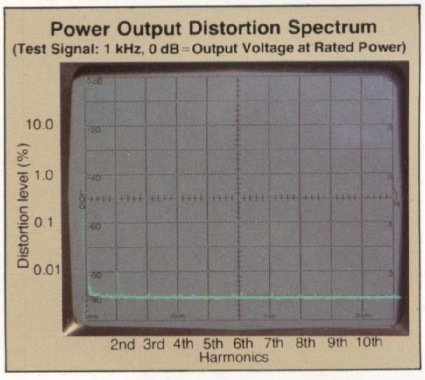
The tuner section is the best ever put into a Technics receiver. It has outstanding specifications, and also a very high degree of waveform fidelity. So it can process a radio signal into an audio signal that's a very close duplicate of the original sound at the broadcast studio.

And there are more features in the SA-1000 than ever before in a Technics receiver. So it will be as enjoyable to use as it is magnificent to hear.

If you're looking for the best possible performance, we know that the SA-1000 will be a top contender for your choice. Because we built it to be just that.

SA-1000 FM/AM Stereo Receiver





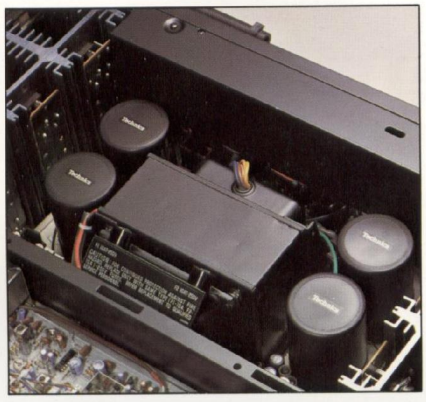
330 Watts per Channel

Measured in compliance with FTC standards, the SA-1000 can generate 330 watts per channel, continuous power into 8 ohms, both channels driven, from 20–20,000 Hz, with no more than 0.03% total harmonic distortion. This means that the receiver won't exceed 0.03% THD at any power level between 0.25 watt and 330 watts in the 20–20,000 Hz range. It's not merely clean at its full rated power, but at very low levels, too. And at half power (165 watts), distortion at 1 kHz is so low that it's barely measurable—0.005%.

0.03% Total Harmonic Distortion

To maintain distortion at such low levels with extremely high power output, an amplifier must be designed with meticulous care and attention to detail, from power supply to output stage. But beyond that, it must also remain stable under the constantly changing conditions encountered with dynamic musical signals. In every way, the SA-1000's power amplifier section is a masterpiece of design:

Massive Power Supply for High Stability
The stability of a receiver's power supply can have an important effect on its sound, particularly in the face of high peak-output conditions. To maintain rock-steady stability, the SA-1000 uses a large (26.4 lb.) low-impedance power transformer with four 18,000 μF electrolytic capacitors, two on each side of the balanced positive/negative power supply.



The driver stages for each channel are completely separate, which helps to virtually eliminate transient crosstalk between them. Furthermore, a constant-voltage power supply is used for the pre-driver and initial stages, contributing to stability under highly dynamic transient conditions.

Driver Stage with Current-Mirror Loaded Differential Amplifier The first stage of each channel's driver is a differential amplifier with current-mirror loading. Current-mirror loading uses both transistors and resistors to load the differential stage. This causes a doubling of signal gain, without a corresponding increase in noise and distortion. The main transistors are a single-packaged pair of transistors with very precisely matched thermal characteristics for stability against temperature drift, and high voltage capacity. Operating with a 100% DC feedback circuit, these differential amplifiers provide extremely low noise and distortion. After the differential amplifiers, emitter-followers are located, which further increase gain and help the performance of the differential amplifiers.

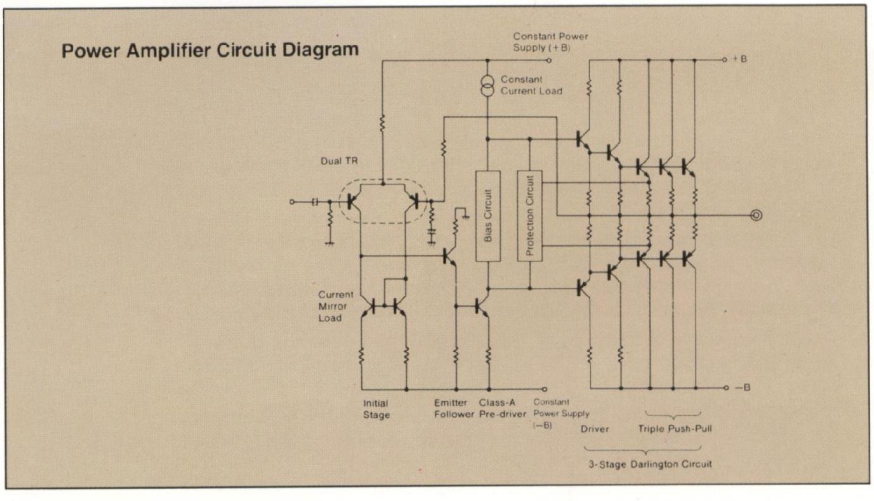
Triple Push-Pull, 3-Stage Darlington Output
A total of six transistors are used in each output channel, operating in a pure-complementary, single-ended push-pull, 3-stage Darlington configuration. A copper plate of 1 mm thickness is employed in the output circuit line connecting the emitters of three transistors. This, together with the Darlington-type configuration, results in low output impedance for minimal power loss and superb extension into the high frequencies. The output stage is direct-coupled OCL (output capacitor-less), which contributes to superb deep-bass extension and high damping factor.

Automatic Load Impedance Detector

This Technics-developed device uses IC logic to optimize power transfer depending on the load impedance of the connected speakers. When the power is turned on, a very low-level signal is generated into the speakers to detect their impedance. Then, depending on whether the load is closer to 4 or 8 ohms, a relay selects the appropriate power supply voltage, via taps of the transformer windings.
By balancing the related factors of voltage and current for different loads, the Automatic Load Impedance Detector reduces heat build-up in the output transistors when 4-ohm loads are connected. At the same time, it allows the necessary voltage for high power output when 8-ohm loads are connected.

Protection Circuitry

With the SA-1000's enormous power potential, it is important to have reliable, quick-acting protection circuitry to protect amplifier components and your valued speakers in the event of circuit malfunctions or accidents.
The SA-1000's protection devices include a current-limiter, an over-current detector and an abnormal voltage detector. Whenever the current becomes dangerously high (such as when speaker wires are shorted), or voltage at the speaker terminals comes close to DC, these sensing devices activate an "OR" circuit that opens two relay switches—one at the secondary winding of the power transformer and the other at the speaker terminals. The speakers and power amp components are thus protected from damage. When the relays are activated, a green LED on the front panel goes out, indicating that the protection circuitry is operational. The relays remain open until the power is turned off.
The speaker-terminal relay also operates in conjunction with a timing circuit that delays activation of the speaker terminals for a few

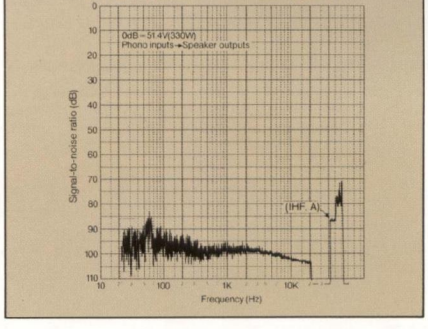


seconds after the power is turned on. This permits the power-amp circuitry to stabilize without causing loud "thumps" in the speakers. Once the circuitry has stabilized, the relay switch closes, the front-panel LED lights up, and normal operation can begin.

Phono Equalizer/Amplifier: Accuracy Combined with Enormous Dynamic range. 97 dB Phono S/N Ratio.

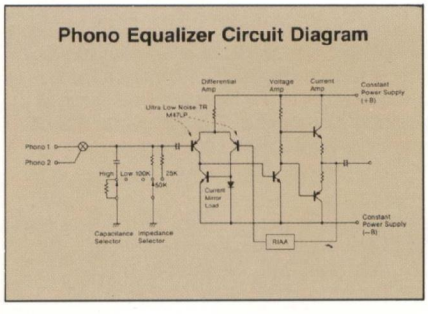
Many records, especially the new direct-to-disc types, can provide extraordinarily dynamic and lifelike sound. To take advantage of these records' potential, a phono equalizer/amplifier must be highly accurate in terms of tonality and transient response, and must also possess very wide dynamic range.
The specifications of the SA-1000's phono stage indicate how well it fulfills these requirements. With a 10 mV reference signal, the signal-to-noise ratio is a spectacular 97 dB, IHF A weighting. It can handle voltages as high as 300 mV at 1 kHz, RMS, with much greater peak tolerance. And it adheres to the industry-standard RIAA equalization curve within ±0.2 dB thanks to the use of 1% tolerance metal-film resistors and 2% tolerance polypropylene capacitors.

Phono Equalizer Noise Spectrum



The first stage of the phono preamp is a current-mirror loaded differential amplifier. As described in the power amp section, current-mirror loading permits gain to be doubled without a corresponding increase in noise and distortion. Two Technics-developed M47LP transistors are used, each of which behaves like eight transistors connected in parallel, providing necessary gain with very low noise. Following the first stage is a low-distortion class-A amplifier, which drives the SEPP output circuit. A constant-voltage power supply to the phono stage provides stability in the face of extremely dynamic signals.

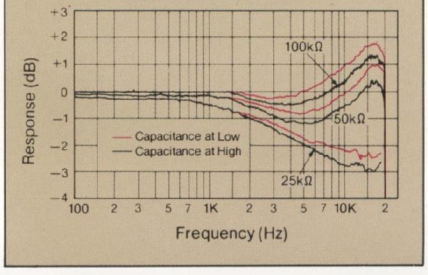
Phono Equalizer Circuit Diagram



Phono Resistance/ Capacitance Selectors

Depending on the phono cartridge you use, subtle improvements in sound can often be made by changing the resistance and capacitance of the load the cartridge works into. The SA-1000 provides front-panel selection of 25, 50 or 100 kilohms, and high or low capacitance. If the high frequencies sound a little too dull or bright, the problem can often be remedied with the resistance and capacitance selectors. These work for both the "Phono 1" and "Phono 2" positions.

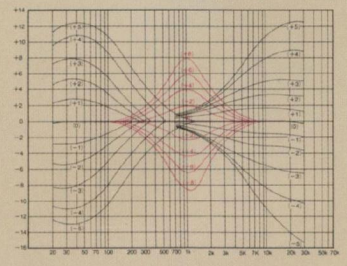
Effect of Phono Resistance/Capacitance Selectors on a Typical MM Cartridge



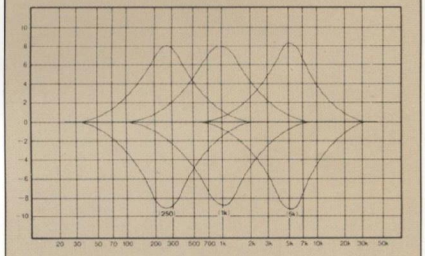
Acoustic Control Provides Elaborate Sound-Tailoring System

Practically all receivers include conventional bass and treble controls, and some have a midrange or "presence" control. While these controls are useful, they always act in the same manner at each setting.
With the SA-1000, controls are provided to change the manner in which each tone control acts at different settings. These extra controls include low and high range "boost/filter" switches, plus a midrange center-frequency adjustment. With these controls, the potential for changing tone-balance is greatly expanded. We call the entire system the "Acoustic Control."
The low "boost" switch injects a peak in the bass range, centering at around 100 Hz. This accentuates drums and bass instruments, but does not affect the very low subsonic frequencies. The high "boost" creates a shelved response in the upper midrange and treble, which adds brightness to overtones. With these "boost" switches in, the bass or treble control can also be adjusted to change the "shape" of the response. The chart shows the difference in each tone control's response with the corresponding "boost" switch in and out. These curves demonstrate the wide variety of tonalities that can be achieved.
In the "filter" positions, these switches provide very steep-slope low and high filter action, beginning respectively at 30 Hz and 8 kHz. Use these to suppress resonances from warped records, or noise in the program material.
Most midrange controls have a fixed center frequency—usually at 1000 Hz. But the SA-1000's midrange control's center frequency is continuously adjustable between 250 Hz and 5 kHz. You can therefore use it to adjust a peak or dip anywhere in this wide area. It can also be used to bring out a singer's voice if it seems a bit too distant on a particular record. Or if a particular instrument was a little too "close-miked" in the recording session for your tastes, you can isolate it and make it blend better with the rest of the music.
The Acoustic Control is a useful and creative tool which, with some practice, you can use to engineer the overall sound balance to your tastes. An "Acoustic Control Defeat" switch lets you switch out all of the Acoustic Control elements—tone controls plus boost settings—for instant comparison with flat, unmodified response.

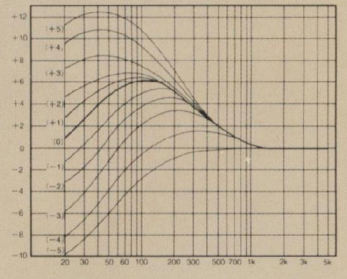
Normal Tone Control response



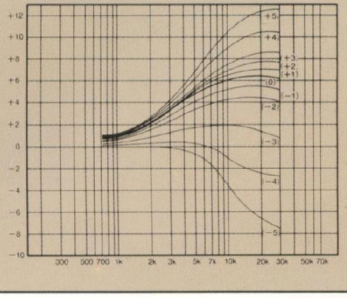
Variable Center Frequency (f_0) of Midrange Tone Control



Bass Control Response with Low "Boost" ON

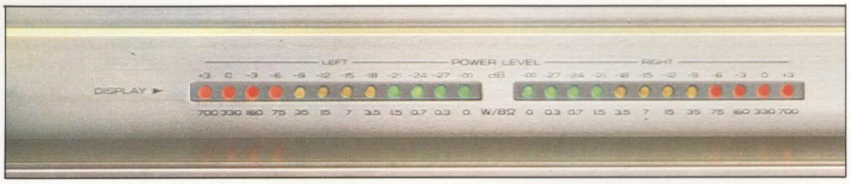


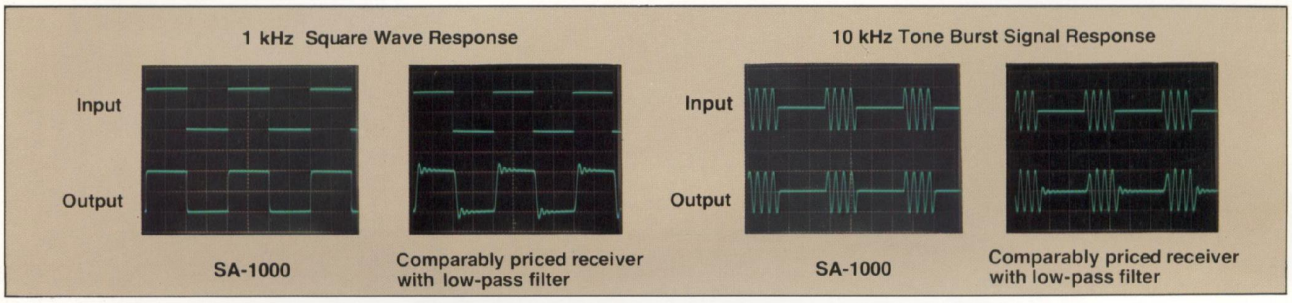
Treble Control Response with High "Boost" ON



LED Peak-Power Indicators

Rather than mechanical meters, the SA-1000 uses faster-acting LED's to give accurate indication of the power peaks being generated by the receiver. These are separated into 12 LED's per channel, which indicate levels from 0.3 watt to 700 watts. The low-power levels are indicated with green LED's, the middle-levels with orange LED's, and the highest (75 to 700 watts) with red LED's. These flashing LED's create a very interesting visual effect, and have two important utilitarian functions, too.
First, they allow you to check power levels. If any of the red LED's are flashing, care should be taken with any further increase in the volume control. Second, they permit you to check channel balance and separation. This is made easier by using the range switches, which can be set to make the LED's read 10 or 100 times the actual power levels being generated. With such high resolution, it becomes easy to adjust for slight channel imbalances in the program material.





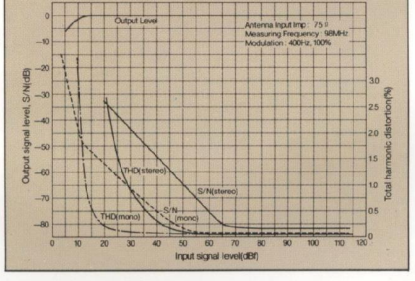
Waveform Fidelity in FM

An FM tuner has two functions: first, to "pull in stations" with a minimum of interference. And second, to extract as pure an audio signal as possible from the radio-frequency signal. Conventional tuner specifications relate mostly to the first function. And the SA-1000 does this job beautifully—high sensitivity and selectivity, high rejection ratios for various kinds of interference, a low capture ratio figure, etc. The second quality, which we call "waveform fidelity," is harder to determine from specifications. It refers to the tuner's ability to reproduce the audio signal so that it's a very close duplicate of what was transmitted by the broadcast station.
Much of this quality is revealed by square wave and tone burst signals, two very demanding tests of a tuner. As you can see, the SA-1000 tuner section shows quick rise time and very little ringing on both these tests. This indicates wide frequency range, superb transient response and well-maintained phase relationships among the frequencies present.
Of course you don't listen to test signals. But the SA-1000's excellent performance with these tests indicate how well it will handle musical signals, preserving their harmonic structures and transient qualities.

FM Circuit Configurations

5-Gang FM Front End with MOS FET's
A 4-pole dual-gate MOS FET is used for RF amplification. This MOS FET combines several desirable characteristics: high sensitivity for weak signals, excellent overload characteristics in the face of strong signals, plus low inherent noise qualities and internal capacitance. A 4-pole, dual-gate MOS FET is used in the mixer, which aids performance in such areas as spurious response rejection, dynamic range and tolerance to strong signals. A junction FET is used as a buffer amp between the mixer and local oscillator to prevent mutual interference between them. The front end is incorporated into a 5-gang linearly variable tuning capacitor whose extraordinary performance is reflected in excellent quieting and interference rejection ratios.

Input Signal Level vs Output Level, S/N & THD

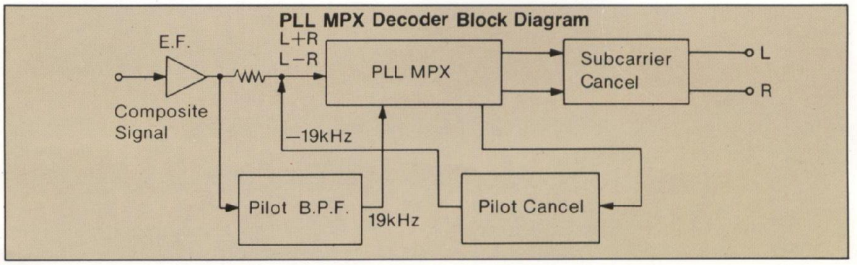


IF Stage Employing "Flat Group Delay" Ceramic Filters The IF stage is traditionally a problem stage in FM tuner design, since the ceramic filters used to obtain high selectivity can also create phase distortion in the signal that would eventually degrade audio quality. To cope with this problem, the SA-1000 incorporates four 2-element "Flat Group Delay" ceramic filters—three of wide-band and one of narrow-band characteristics. These filters do an excellent job of providing high selectivity (85 dB), while at the same time maintaining uniform time-delay among the different frequencies of the signal. Significant phase distortion is thus avoided. In all, six IF stages are used, including two differential amplifiers, for linear gain and excellent limiting.

High-Linearity Detector Stage The SA-1000 uses an extremely well-designed ratio detector for the purpose of extracting audio signals from the IF processed signal. The high-quality discriminator transformer and the carefully selected and matched detector diodes help to provide wide, flat frequency response with very low distortion. The ratio detector and audio-amplifier stages can tolerate signals that have been grossly overmodulated at the broadcast station—by as much as 3 times the level the FCC allows—without significant distortion or loss of high frequencies. This wide tolerance assures linear operation with virtually any signal you're likely to receive.

Phase-Locked-Loop (PLL) Multiplex Stage with Double-Differential Switching A PLL IC keeps the switching signals generated by the tuner in precise phase with pilot and subcarrier signals generated by the broadcast station. The result is low distortion and very stable FM stereo performance, with wide separation maintained between channels. Double-

PLL MPX Decoder Block Diagram



differential switching further enhances the stability of separation, and removes the need for an SCA filter, which could impair audio quality. Use of an IC, rather than discrete parts, for the PLL circuitry makes its performance impervious to temperature and humidity fluctuations, and removes the need for periodic realignment of the MPX stage.

Pilot and Subcarrier Signal Cancellers Permit Ultra-Wide Frequency Response While the high-frequency extension of FM broadcasts normally does not exceed 15 kHz, it is nevertheless important to optimize response past this point to achieve a high degree of waveform fidelity. Low-pass filters, which are normally used to attenuate the 19 kHz pilot and 38 kHz subcarrier signals, can introduce some frequency-response roll-off and phase shift beginning even as low as 10 kHz. As a much better alternative, the SA-1000 uses pilot and subcarrier signal cancellers. These operate by using 19 and 38 kHz signals that are precisely 180° out-of-phase with the pilot and subcarrier. This results in very sharp attenuation of these signals, with virtually no effect on the audio range, as evidenced by the 20–18,000 Hz (+0.2, −0.8 dB) frequency response in FM stereo.
When taping FM broadcasts, it may be preferable in some cases to use a low-pass filter. For these situations, the SA-1000 is equipped with a low-pass filter that may be switched into the circuit via a front-panel pushbutton selector.

Double-Action FM Muting

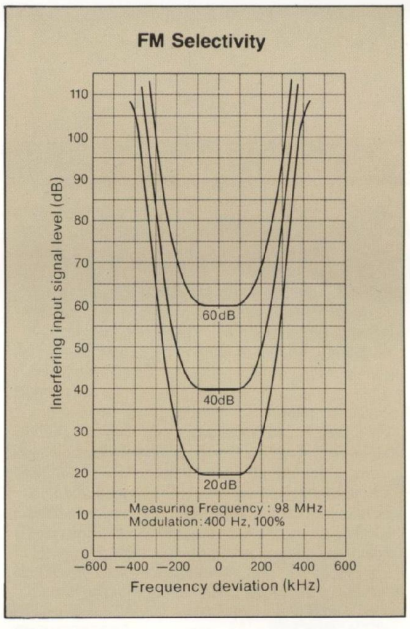
FM muting is applied at two points—in the IF stage and after the MPX stage. In the IF stage, an AND-type circuit is used to sense a sufficiently strong broadcast signal, and to completely mute all other signals, such as inter-station noise. At the same time, muting is applied after the MPX stage to suppress the transitional pulse noises as the tuner switches from mute to non-mute conditions and back again.

FM Hi-Blend

When receiving a weak, distant FM stereo broadcast, background hiss can be greatly reduced by using the FM hi-blend switch. This blends together the higher audio frequencies into essentially a monophonic signal, but as a result, much of the noise components are cancelled out. And full stereo separation is still maintained in the midrange and lower frequencies.

High-Quality AM Section

While some receivers' AM sections might almost seem like an afterthought, this certainly isn't the case with the SA-1000.
A 3-ganged variable tuning capacitor provides tuned RF amplification. And triple-tuned coils in the IF stage contribute to excellent selectivity. As a result, you can expect high-quality sound when you choose to listen to AM. A rear-panel bar antenna can be adjusted to reduce interference in areas where the AM band is very crowded.



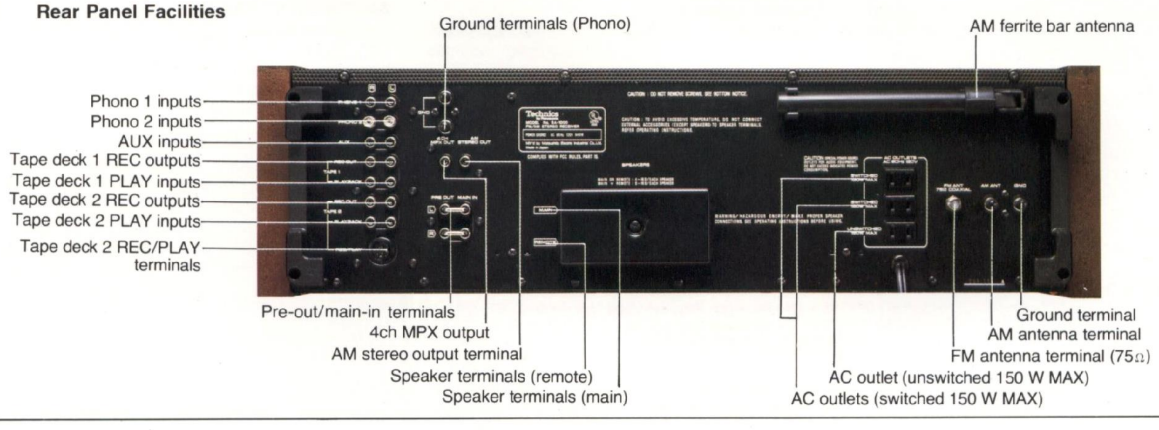
Other Convenience and Operating Features

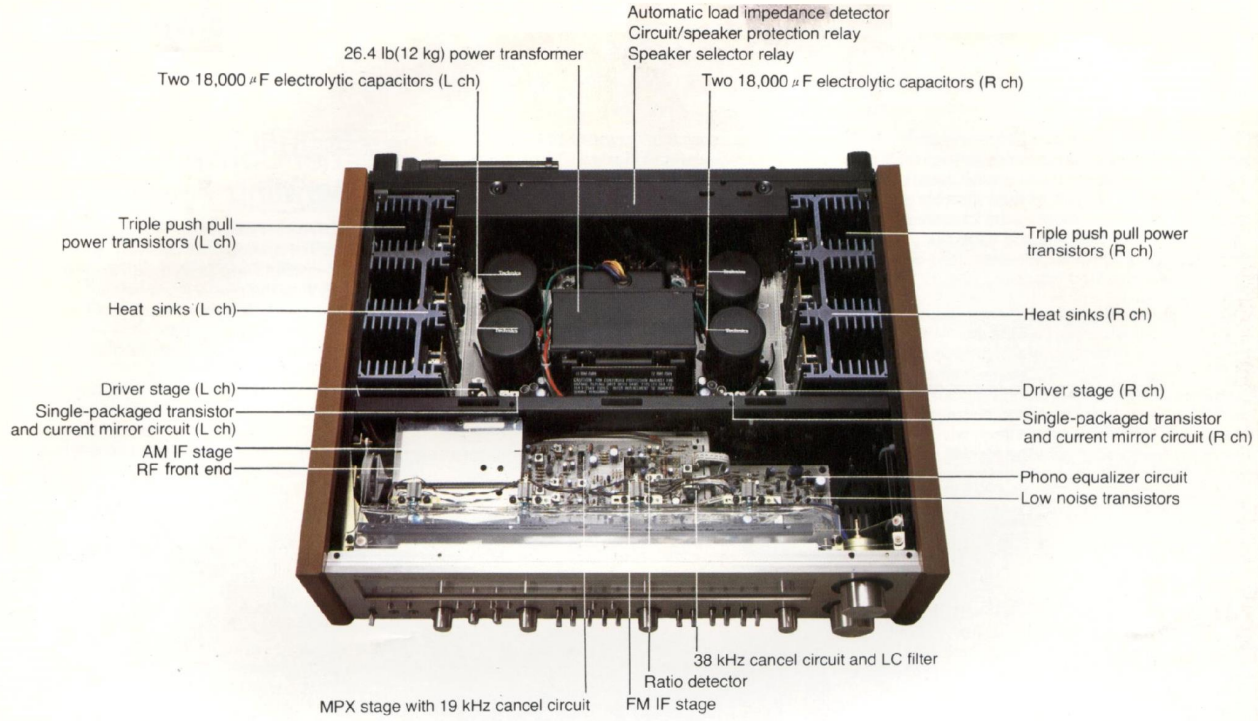
Preamp/Amp Features
- Two tape monitors with two-way dubbing. You can connect two tape decks and dub from either deck to the other. If you prefer, you can listen to another source (a record or the tuner) while dubbing is in progress.
- DIN record/play jack for connecting tape decks that employ a DIN plug.
- 26-step, true attenuator-type volume control.
- Audio muting switch, lowers audio output by 20 dB. If your speakers are very efficient, you may wish to use this switch for low-volume listening. It also permits instant lowering of volume without touching the volume control.
- Detented tone and balance controls.
- Loudness compensation switch.
- Main and remote speaker connections. Once connections are made, the terminals should be covered with the provided plate for protection. Front-panel selection of main and/or remote speaker pairs.
- Stereo/mono mode switch.
- Two phono inputs.
- Two front-panel headphone jacks.
- Auxiliary input jacks.
- Program-source LED indicators.
- Pre-out/Main-in jacks for expanding your system. E.g., bi- or tri-amplification, adding external processors, etc.

Tuner Features
- Mirror-reflection tuning scale and smoothly operating flywheel knob facilitate pinpoint tuning.
- Two tuning meters: signal-strength for FM and AM, center-of-channel for FM. Signal-strength meter shows maximum indication only with very strong signals (65 dBf in FM), making it an excellent aid for orienting your antenna.
- FM stereo indicator.
- F-type connection for 75-ohm antenna, with adaptor for 300-ohm antenna.
- Jacks for adding FM quad and AM stereo adaptors should these become available.

General Features
- Rear-panel guard protects terminals from damage.
- 3 AC plugs for connecting other components.
- Two ground connection terminals.

Rear Panel Facilities





Technical Specifications

POWER AMPLIFIER SECTION

Rated minimum sine wave
RMS power output
20 Hz～20 kHz
both channels driven
0.03% total harmonic distortion
330W per channel (8 ohms)
330W per channel (4 ohms)

1 kHz continuous power output both channels driven 0.03% total harmonic distortion	340W per channel (8 ohms) 360W per channel (4 ohms)
Total harmonic distortion	0.03% at rated power (20 Hz～20 kHz, 8 ohms, 4 ohms) 0.01% at half power (20 Hz～20 kHz, 8 ohms) 0.02% at half power (20 Hz～20 kHz, 4 ohms) 0.005% at half power (1 kHz, 8 ohms, 4 ohms)
Intermodulation distortion	0.03%
Frequency response	5 Hz～90 kHz, −1 dB
S/N (IHF, A)	115 dB
Residual hum & noise	0.3mV
Damping factor	160 (8 ohms) 80 (4 ohms)
Input sensitivity and impedance	1.5V/47 kΩ
Load impedance	
MAIN or REMOTE	4～16 ohms
MAIN+REMOTE	8～16 ohms

PREAMPLIFIER SECTION

Input sensitivity and impedance	
PHONO 1, 2	2.5mV/25k, 50k, 100 kΩ
AUX	150mV/47 kΩ
TAPE 1 PLAYBACK	150mV/47 kΩ
TAPE 2 PLAYBACK	180mV/47 kΩ
TAPE REC/PLAY	180mV/47 kΩ
PHONO maximum input voltage (1 kHz, RMS)	300mV
S/N (IHF, A)	
PHONO	97 dB (at 10mV) 85 dB (at 2.5mV)
AUX	100 dB
Frequency response	
PHONO	RIAA standard curve ±0.2 dB
AUX	20 Hz～20 kHz +0 dB, −0.3 dB 5 Hz～40 kHz, −1 dB
Tone controls	
BASS	50 Hz, +10 dB～−10 dB
MID	1 kHz, +8 dB～−8 dB
MID fo	250 Hz～5 kHz
TREBLE	20 kHz, +10 dB～−10 dB
Acoustic control (at tone "0" position)	
LOW BOOST	100 Hz, +6 dB
HIGH BOOST	10 kHz, +6 dB
Low filter	30 Hz, −12 dB/oct.
High filter	8 kHz, −12 dB/oct.
Loudness control (volume at −30 dB)	50 Hz, +9 dB
Muting	−20 dB
Output voltage and impedance	
PRE OUT	rated 1.5V/100 ohms maximum 3V/100 ohms
TAPE 1, 2 REC OUT	150mV
TAPE REC/PLAY	30mV/80 kΩ

FM TUNER SECTION

Frequency range	88～108 MHz
Sensitivity	10.3 dBf (0.9μV 75ΩIHF '58)
50 dB quieting sensitivity	
MONO	12.8 dBf (1.2μV 75ΩIHF '58)
STEREO	36.2 dBf (17.7μV 75ΩIHF '58)
Total harmonic distortion	
100 Hz	0.1% (mono), 0.1% (stereo)
1 kHz	0.1% (mono), 0.1% (stereo)
6 kHz	0.2% (mono), 0.2% (stereo)
S/N	
MONO	83 dB
STEREO	80 dB
Frequency response	20 Hz～18 kHz, +0.2, −0.8 dB
Alternate channel selectivity	85 dB
Capture ratio	1.0 dB
Image rejection at 98 MHz	100 dB
IF rejection at 98 MHz	120 dB
Spurious response rejection at 98 MHz	110 dB
AM suppression	60 dB
Stereo separation	
1 kHz	50 dB
10 kHz	40 dB
Carrier leak	−70 dB (19 kHz) −70 dB (38 kHz)
Antenna terminals	75 ohms F-type

AM TUNER SECTION

Frequency range	525～1605 kHz
Sensitivity	30μV, 250μV/m
Selectivity	35 dB
Image rejection at 1000 kHz	90 dB
IF rejection at 1000 kHz	80 dB

GENERAL

Power consumption	640W
Power supply	AC 120V, 60 Hz
Dimensions (H×W×D)	7-17/32"×24-13/16"×21-3/32" (191×630×536 mm)
Weight	87.1 lb. (39.5 kg)

Simulated wood cabinet

Technics

Panasonic Company
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