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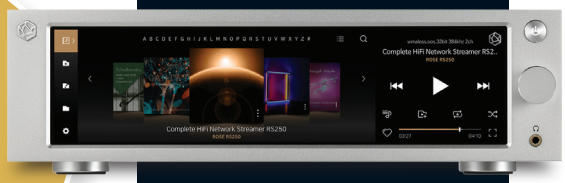

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Technics SU-R1000

INTEGRATED AMPLIFIER

Technics, an arm of the Japanese giant Panasonic Corporation, has long been a major player in the hi-fi world, even if, in some recent decades, it stayed below the radar.

In the 1970s, analog-centric audiophiles particularly praised the Technics SP-10, the world's first direct drive turntable. Created by Matsushita engineer Shuichi Obata in 1969, the SP-10 and its successors became the standard in vinyl playback for American radio stations during that heyday of broadcast radio. Because of its powerful motor, the SL-1200 became the spinner/scratcher of choice among hip hop DJs soon after its 1972 introduction; Grandmaster Flash, Kool Herc, and Grand Wizard Theodore are among the hip hop DJs who favored the SL-1200. (The latter is said to have invented the scratching technique.) Later versions of the SL-1200 maintained an important cult following among analog audiophiles.

Both 'tables continue in use today, and new versions of both were introduced in recent years, the SL-1200 G in 2016—the 50th anniversary of the SL-1200—and the SP-10R in 2018.

It was as if Donald Fagen and his background vocalists were singing to me, alone.

Even if the Technics story ended with turntables, its spot in hi-fi history would be secure. But it doesn't. 1965's Technics 1 loudspeaker advanced the design of sealed-box loudspeakers. In 1966, the company introduced the 10A tubed preamplifier and 20A stereo power amp, the latter an OTL design that output 30Wpc into 8 ohms and 60Wpc into 16 ohms using 20 pentode tubes. Technics brought "linear phase design" to 1975's Technics 7 loudspeaker, an "isolated loop system" to 1976's RS-1500U reel-to-reel tape deck, and a class-A

SPECIFICATIONS

Description Two-channel "digital" integrated amplifier with phono stage and remote control. Output power: 150Wpc at 8 ohms, 300Wpc at 4 ohms (both 21.8dBW). Input sensitivity: Line 200mV for full output; MM phono (MM) 2.5mV; MC phono 300µV. Input impedance: Line inputs, 22k ohms; MM phono, 47k ohms; MC phono, 100 ohms. Frequency response: Line, 5Hz–80kHz (–3dB); MM phono, 20Hz–20kHz (RIAA deviation ±1dB); MC phono, not specified; Digital, 5Hz–80kHz (–3dB). Recommended load impedance: 4–16 ohms. Analog inputs: 1 balanced (XLR), 2 single-ended (RCA), 1 phono RCA (MM/MC), 1 phono XLR (MC), 1 main in, 1 rec in. Digital inputs: 2 TosLink, 2 S/PDIF RCA, 2 USB-B USB Audio Class 2.0 Asynchronous. Analog outputs: 1 pre out, 1 rec out, two pair brass loudspeaker binding posts, 6.3mm stereo headphone. Supported formats: PCM 32, 44.1, 48, 88.2, 96, 176.4, 192, 352.8, 384kHz at 16, 24, and 32 bits; DSD: 2.8MHz, 5.6MHz, 11.2MHz, 22.4MHz; ASIO, Native mode only. **Dimensions** 17" (430mm) W × 7 ½" (191mm) H × 18 ⅛" (459mm) D. Weight 50.3lb (22.8kg).

Serial number of unit reviewed GJ1AA001007, GJ1DA001010. "Made in Malaysia."
Price $9499. Number of US dealers: "A total of 32 storefronts."
Manufacturer
Technics, Panasonic Consumer Electronics Corporation
Two Riverfront Plaza
Newark, NJ 07102.
Web: technics.com/us.

platform in 1977's SE-A1 DC power amplifier.

Most important of all, Technics's solid and affordable receivers, turntables, and cassette players were enjoyed by pretty much every music lover of modest means who grew up in the 1970s and '80s.

The SP-10R and SL-1200G turntables were introduced soon after what Panasonic called the Technics relaunch, which commenced in 2014. There was also the SU-R1 Network Audio Control Player and the SE-R1 Digital Amplifier, which incorporated the "JENO (Jitter Elimination and Noise-shaping Optimization) Engine," "LAPC (Load Adaptive Phase Calibration)," and GaN (gallium nitride) FET driver transistors. 2017's SU-G700 Digital Integrated Amplifier introduced "High-speed Silent Hybrid Power Supply." Judging by these and other trademarked descriptors, the new Technics started to look like a high-tech innovator.

For sheer technological boldness, none of these other Technics products could match the SU-R1000 Digital Integrated Amplifier ($9499).

Why bold? The SU-R1000 digitizes all incoming signals, including those headed to its phono stage; that will ruffle the feathers of some and fascinate others, but it makes possible some manipulations that cannot be done in the analog realm. The SU-R1000 includes the LAPC and JENO Engine and adds ADCT (Active Distortion Cancelling Technology), AS2PS (Advanced Speed Silent Power Supply), and four independent GaNFET (Gallium Nitride Field Effect Transistor) power supplies, one each for analog and digital processing, one each for the left and right output stages. The SU-R1000 allocates three distinct processing functions in the phono stage alone, naming the cumulative result Intelligent Phono EQ. See below for descriptions of the new Technics techniques.

Technical features

The R in SU-R1000 stands for Reference Class, alluding to this whole line of Technics Reference components. It's the same "R" that's in the SP-10R.

Some companies that make class-D amplifiers are content to have their technology labeled class-D—just don't call it digital. Technics is happy to have the amplification technology in the SU-R1000 called digital—in fact they insist on it—just don't call it class-D!

"Technics' digital amplifier is often mistaken as class-D, but strictly speaking, Technics' digital amplifier is not class-D," company CTO Tetsuya Itani writes in a Technics white paper. "Class-D … is a … method that applies analog signal technology such as sawtooth wave generation and comparator, so it has the drawbacks of conventional analog amplifiers, such as the possibility of distortion and noise mixing, depending on the accuracy of parts, etc. Further, since the input is an analog sound signal, it is necessary to [perform] D/A

MEASUREMENTS

I started testing the sample of the Technics SU-R1000 that KM had auditioned, serial number GJ1001007, with my Audio Precision SYS2722 system (see the January 2008 As We See It[1]). However, while I was performing the small-signal tests, the amplifier turned itself off. The temperature of the black grilles on the amplifier's top panel, which cover the internal heatsinks, was 127.9°F/52.9°C. I wondered if the amplifier had overheated. According to the manual, "one of the unit's safety devices may have been activated. Press the unit on/off button to the Off position. If the unit does not switch to standby, disconnect the AC power supply cord, wait for at least 3 minutes, then reconnect it."

I followed these instructions, waiting 20 minutes instead of 3 minutes to allow the amplifier to cool down. However, when I turned the amplifier on, it turned itself off and would not turn itself on again. Bill Voss, Technics US's business development manager, had a new sample, serial number GJ1DA001010, shipped to me so that I could continue with the measurements.

As the SU-R1000 has an output stage operating in a mode that resembles class-D (although Technics says that it's not class-D), I inserted an Audio Precision auxiliary AUX-0025 passive low-pass filter between the test load and the Audio Precision analyzer. This filter eliminates RF noise that could drive its input circuitry into slew-rate limiting. I used it for all the loudspeaker output tests other than frequency response. After two hours of operation, the temperature of the black grilles was lower than that of the first sample, at 114.2°F (45.7°C).

I looked first at the Technics's performance via its balanced and single-ended line inputs. The SU-R1000 preserved absolute polarity at all outputs. The volume control operated in accurate 0.5dB steps, and the maximum gain at the loudspeaker outputs was 46.5dB for both types of inputs. (The optional 20dB attenuation was bypassed for this measurement.) At the preamplifier output, the gain was 16.7dB and at the headphone output it was 33.1dB. The Technics's power amplifier can be accessed separately. It offered a fixed gain of 30.1dB. The input impedance at the unbalanced line inputs was 50k ohms at 20Hz and 1kHz, with an inconsequential drop to 37k ohms at 20kHz. The balanced input impedance was 92k ohms at low and middle frequencies, dropping to

1 See stereophile.com/content/measurements-maps-precision.

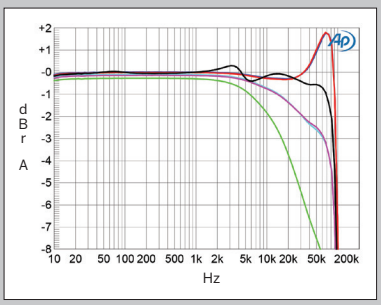


Fig.1 Technics SU-R1000, volume control set to maximum, frequency response at 2.83V into: simulated loudspeaker load (gray), 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta), 2 ohms (green) (1dB/vertical div.).

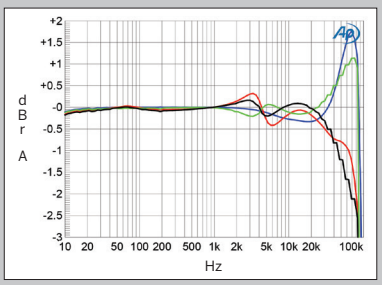
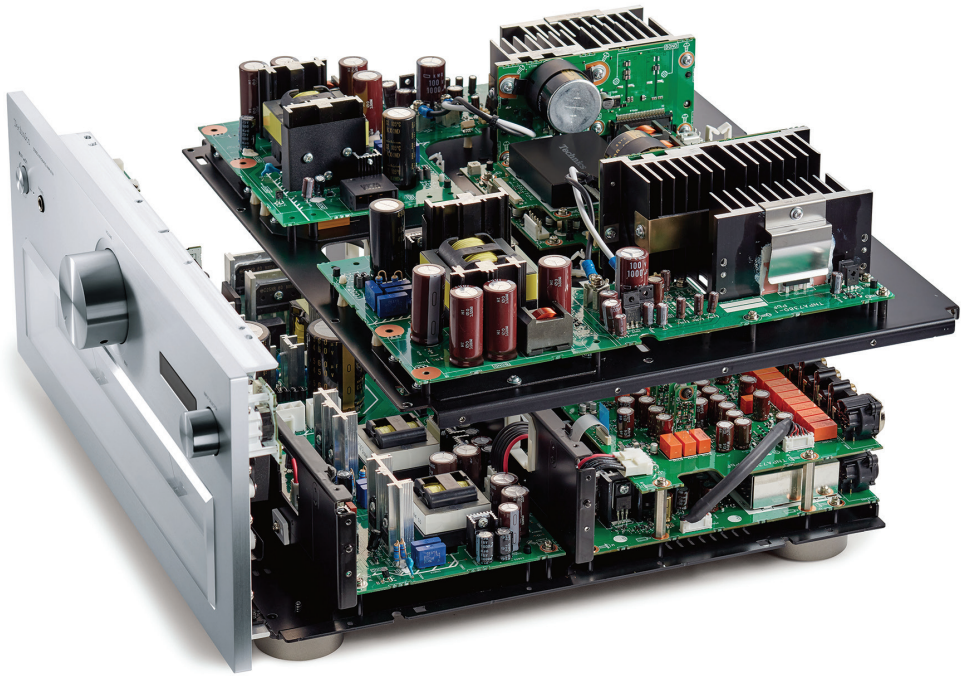


Fig.2 Technics SU-R1000, volume control set to –20dB, frequency response at 2.83V into simulated loudspeaker load (red) and 8 ohms (blue) with LAPC bypassed, and into simulated loudspeaker load (gray) and 8 ohms (green) with LAPC activated (0.5dB/vertical div.).

conversion on the digital signal, and there is a limit to accuracy in handling a high-precision signal such as high-res sound. Technics' full digital amplifier processes digital input *as it is* with high precision, so it is advantageous, especially when handling high-res signals. When dealing with analog signals, a 192kHz/24bit high precision A/D converter is used to ensure high performance." To perform this task, the SU-R1000 utilizes the AK5572EN 1740EAC ADC chip from AKM.

The following explanations of the SU-R1000's processing functions were based on a recent webinar focused on the SU-R1000; email conversations with Frank Balzuweit, Technics's business-development manager for consumer electronics; and online sources.



measurements, continued

64k ohms at the top of the audioband. The input impedance at the single-ended power amplifier input jacks was 50k ohms at 20Hz, 65k ohms at 1kHz, and 42k ohms at 20kHz.

The amplifier's output impedance at the headphone output was a relatively high 100 ohms. At the preamplifier output, it ranged from 728 ohms at 20Hz to 706 ohms at 20kHz. The output impedance at the loudspeaker terminals was 0.09 ohm at 20Hz and 1kHz rising to 0.7 ohm at 20kHz. (These figures include the series impedance of 6' of spaced-pair loudspeaker cable.) The modulation of the amplifier's frequency response due to the Ohm's law interaction between this source impedance and the impedance of my standard simulated loudspeaker[2] was therefore a low ±0.25dB (fig.1, gray trace). The response into an 8 ohm resistive load (fig.1, blue and red traces) peaked by almost 2dB at 70kHz but rolled off rapidly above that frequency. (The analog inputs appear to be digitized with a sample rate of 192kHz.) With a resistive 4 ohm load (cyan and magenta traces), the output started to roll off slightly in the top audio octave, reaching –3dB at 61kHz. Into 2 ohms (green trace), the output was down by 3dB at 18kHz. This graph was taken with the volume control set to its maximum. The excellent channel matching was preserved at lower settings of the control.

The SU-R1000 has a unique LAPC function, which is intended to compensate for the changes in a loudspeaker's impedance with frequency. I investigated this by connecting an 8 ohm resistor to the left channel and my simulated loudspeaker to the right. (I don't have two simulated loudspeakers, and I assumed that LAPC would be set differently for the two channels.) I selected LAPC with the remote control, waited for the amplifier to finish measuring the load impedances, and after it said that it was finished, I measured the SU-R1000's frequency response with and without LAPC. The blue and

2 See stereophile.com/content/real-life-measurements-page-2.

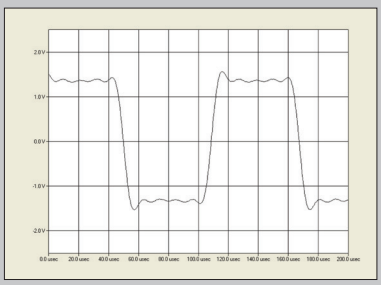


Fig.3 Technics SU-R1000, small-signal 10kHz squarewave into 8 ohms.

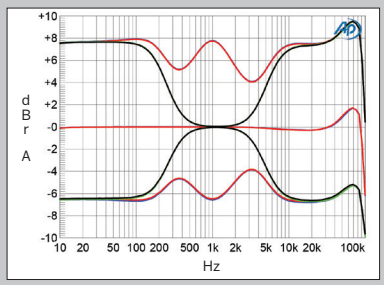


Fig.4 Technics SU-R1000, frequency response at 2.83V into 8 ohms with treble, midrange, and bass controls set to their maximum and minimum and set to "0" (left channel blue, right red), and with midrange set to "0" (left green, right gray, 2dB/vertical div.).

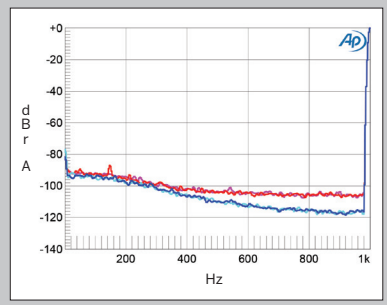


Fig.5 Technics SU-R1000, spectrum of 1kHz sinewave, DC–1kHz, at 1W into 8 ohms, volume control set to maximum (left channel magenta, right red) and to –20dB (left cyan, right blue; linear frequency scale).

The JENO engine

"JENO" is short for "Jitter Elimination and Noise-shaping Optimization."

"To eliminate the degradation of sound caused by jitter, Technics has developed an original jitter reduction circuit"—the JENO engine—"comprising a clock generator in the noise-shaping system to reduce jitter in the low-frequency range and a high-precision sample rate converter for suppressing jitter in the high-frequency range. Thus it reduces jitter in an ideal way over the entire frequency range."

The JENO engine is employed during the conversion of PCM signals into PWM—pulse-width modulation, similar to the technology behind DSD. "In the JENO Engine, there is a low-jitter sample rate converter, lifting all incoming signals to 32bit/768kHz PWM," Balzuweit explained in an email. "Then 1-bit conversion is performed in the Delta-Sigma converter to form an intermediate signal as a preparation to drive the output transistors."

"After the Delta-Sigma converter," he continued, "there is another stage, the PWM converter, which forms a so-called 'ternary' (2-bit) signal out of the 1.5MHz 1-bit signal. So, each transistor only has to handle a switching speed of 768kHz/1-bit, which is easier to handle in terms of the natural response time of a GaNFET." This is an important bit: gallium nitride field-effect transistors—GaNFETs—are capable of higher switching speeds with low distortion and little ringing. "Actually, the two signals of 768kHz/1-bit are overlapping: Each one addressing either the + or the – driver effectively work as a 1.5MHz, 1-bit (binary) signal. There is no D/A conversion needed to drive the speakers. The data flow of the ternary output is driving the speakers directly."

What's ADCT?

ADCT is short for Active Distortion Cancellation Technology. "ADCT addresses the distortions at an amp's output

measurements, continued

red traces in fig.2 were taken without LAPC and are identical to the blue and gray traces in fig.1, plotted with an expanded scale. The green and gray traces respectively show the responses of the 8 ohm resistor and the simulated loudspeaker with LAPC. The variations in response have been reduced in amplitude but not eliminated. I suspect that the SU-R1000 is applying the same LAPC compensation to both channels; in real-world use of course, the channels would be connected to identical loudspeakers.

The peak at 70kHz with 8 ohms in fig.1 correlates with the slight overshoot with the Technics's reproduction of a 10kHz squarewave's leading edges into that load (fig.3). There is also some ringing and a slight overshoot with the waveform's trailing edges, both of which will be due to the antialiasing filter of the amplifier's A/D converter. There are three tone controls: bass, midrange, and treble. These offered a maximum boost of 7.8dB and a maximum cut of 6.3dB (fig.3, blue and red traces). The gray and green traces were taken with the midrange control operating but set to "0." You can see that this control covers the region between 300Hz and 3kHz.

Channel separation was excellent, at >100dB in both directions below 2.5kHz and still 67dB at the top of the audioband. Without the auxiliary low-pass filter, 316mV of ultrasonic noise was present at the loudspeaker outputs. With the filter, the Technics's unweighted, wideband signal/noise ratio, taken with the unbalanced line inputs shorted to ground but the volume control set to its maximum, was 48.2dB ref. 2.83V into 8 ohms in both channels. (Note that the filter is not designed to remove all ultrasonic noise.) This ratio improved to 71dB when the measurement bandwidth was restricted to the audioband, and to 74.4dB when A-weighted. Spuriae at the supply frequency of 60Hz and its harmonics were absent in the amplifier's output, but the spectrum of the random noise background varied with the setting of the volume control. The magenta and red traces in fig.5 were taken with the volume control set to the maximum. Reducing the volume to "–20.0" lowered the levels of the

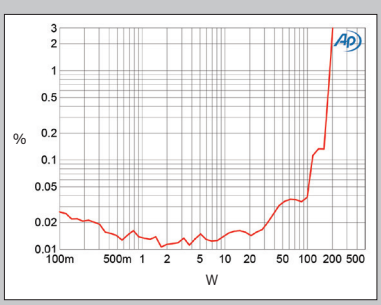


Fig.6 Technics SU-R1000, distortion (%) vs 1kHz continuous output power into 8 ohms.

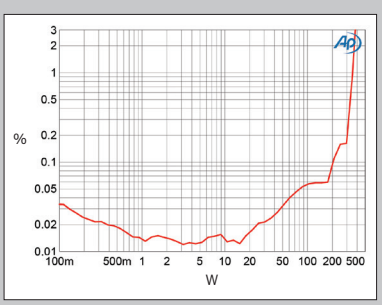


Fig.7 Technics SU-R1000, distortion (%) vs 1kHz continuous output power into 4 ohms.

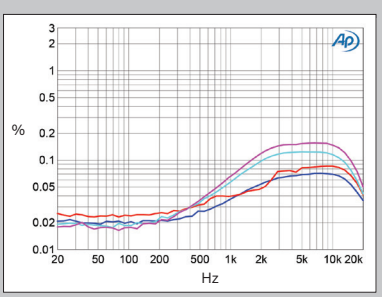


Fig.8 Technics SU-R1000, THD+N (%) vs frequency at 20V into: 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta).

caused by the back electromotive force of the speakers," Balzuweit wrote. "You can apply negative feedback to the input, but this is only partially effective and negatively affects transients. With ADCT, we extract the distortion caused by the back electromotive force. The output signal, which is analog, is digitized and then calibrated. As [that] signal has high level, it is reduced in gain and purified [of] eventual DC offset. The resulting signal then is compared with the pure, undistorted signal directly at the JENO Engine's output. Both signals are subtracted, the result is the distortion part only! This signal part is fed back with [a] negative signal to the JENO's input, and distortion is thereby effectively eliminated. We aren't feeding back the full music signal, *only* the distortion. This is unique, and you can never ever do the same on an analog linear amp."

And LAPC?

LAPC stands for Load Adaptive Phase Calibration. It uses DSP to "measure output gain and impedance phase characteristics of the amp and speaker, creating an ideal impulse response for any speaker," Balzuweit told me. LAPC is measured and implemented using a series of test tones enabled by pressing the remote's LAPC button. It seems to resemble Devialet's SAM—short for "Speaker Active Matching"[1]—although there are some obvious differences.

AS2PS

AS2PS, or Advanced Speed Silent Power Supply, refers to the SU-R1000's switching power-supply technology, which is said to be much quieter and stabler than typical analog power supplies. The SU-R1000 has four power supplies—one for analog, one for digital, and one for each output stage—separated and shielded by steel divider plates, which help block interference and further reduce transmitted noise.

Intelligent Phono EQ

Perhaps the SU-R1000's most radical technology is reserved for the oldest medium the amplifier supports. Intelligent Phono EQ comprises three features: Accurate EQ, Crosstalk Canceller, and Response Optimizer. Technics calls it a "hybrid" system: "The high-gain low-pass filter (LPF) performs analogue processing, while high frequencies are raised after the A/D conversion." The SU-R1000 offers a choice of seven EQ curves: RIAA, Decca/London, Columbia, AES, IEC, NAB, and RCA.

Oddly for an amplifier—especially one that digitizes its analog inputs—the SU-R1000 comes with an LP, which is used to measure and implement the Crosstalk Cancel-

1 See stereophile.com/content/devialet-expert-140-pro-integrated-amplifier-page-2.

measurements, continued

random noise at higher frequencies in both channels (cyan and blue traces). However, even at the maximum volume control setting the noise is relatively low in level.

With both channels driven, the SU-R1000 exceeded its specified maximum power into 8 ohms of 150Wpc (21.76dBW), delivering 190Wpc at 1% THD+noise (22.8dBW, fig.6). Into 4 ohms, the Technics clipped at 355Wpc (22.5dBW, fig.7), which is still higher than the specified power into that load. I didn't test clipping power into 2 ohms, as the amplifier isn't specified into that load. The distortion is low at low powers, so I examined how the THD+N varied with frequency at 20V, which is equivalent to 50W into 8 ohms and 100W into 4 ohms. The results are shown in fig.7. The distortion is very similar into both impedances, at <0.03%. It does rise in the top two octaves, however—more into 4 ohms (cyan and magenta traces) than into 8 ohms (blue and red traces).

The distortion was predominantly the third harmonic (fig.9), but at low and moderate powers it lay below the analog noisefloor. The third harmonic can just be seen at –89dB (0.003%) when the Technics drove a 50Hz tone at 100Wpc into 4 ohms (fig.10) with the volume control set to –12dB. I got somewhat different results in the two channels when the SU-R1000 drove an equal mix of 19 and 20kHz tones at 50W peak into 8 ohms (fig.11). The second-order difference product at 1kHz is very low in both channels, at close to –110dB (0.0003%), but more high-order products are present in the right channel (red trace) than the left (blue). I repeated this test with different signal and speaker cables and with the analyzer input channels swapped but got the same result each time. It is fair to note that other than those at 17kHz, 18kHz, 21kHz, and 22kHz, all the intermodulation products lay at or below –84dB (0.006%) in both channels.

The Technics SU-R1000 offered excellent measured performance from its line inputs. My testing of its digital and phono inputs will be included in next month's Follow-Up section.

—John Atkinson

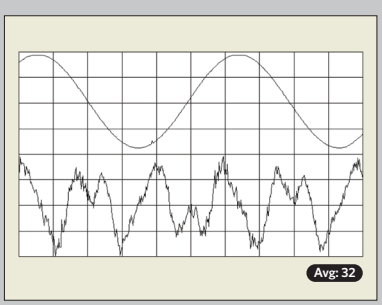


Fig.9 Technics SU-R1000, 1kHz waveform at 50W into 8 ohms, 0.052% THD+N (top); distortion and noise waveform with fundamental notched out (bottom, not to scale).

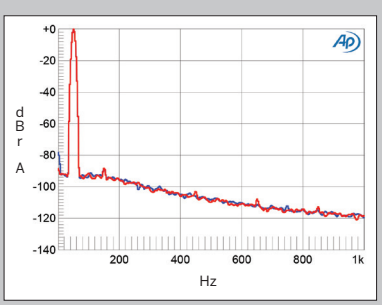


Fig.10 Technics SU-R1000, spectrum of 50Hz sinewave, DC–1kHz, at 100W into 4 ohms (left channel blue, right red; linear frequency scale).

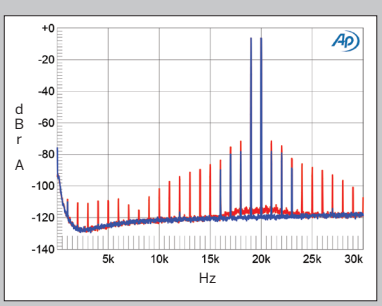


Fig.11 Technics SU-R1000, HF intermodulation spectrum, DC–30kHz, 19+20kHz at 50W peak into 8 ohms (left channel blue, right red; linear frequency scale).

ler and Response Optimizer. Crosstalk Canceller "measures the crosstalk characteristic of the installed cartridge by using the crosstalk measuring signal recorded on the calibration record," states the website. "It then performs reverse-correction using the built-in DSP to achieve significant improvement of the crosstalk characteristic."

"Response Optimizer," the site continued, "measures the frequency characteristics of the installed pickup cartridge by using a TSP (Time Stretched Pulse) signal recorded on the bundled calibration record and corrects … the effect of impedance matching between the pickup cartridge and the phono equalizer to reveal the true sound quality of the cartridge."

"The disc measures gain and phase response over 400 points across the entire audible frequency band," Balzuweit said. "This improves transparency, imaging, and depth." Crosstalk Canceller and Response Optimizer can be turned on or off using the unit's stocky, brushed aluminum remote, permitting easy before-and-after comparisons.

I found myself thinking while playing familiar recordings: "That's on this record?"

The basics

The SU-R1000's knobs and front panel are formed from 10mm aluminum; the side and top panels are made of 6mm alumite-treated aluminum plates. As already noted, steel plates divide the top and bottom sections and the left and right channels; the plates act as reinforcement to make the chassis more rigid and resist vibrations.

Visually, the SU-R1000 resembles Technics products from the mid-1990s: lots of silver brushed aluminum. A large volume knob and a large viewing window, the latter exposing those familiar Technics VU meters. A finger-friendly power button is stationed top left, followed by a power indicator light, a quarter-inch headphone jack, that volume knob, a small (but visible) source display, an input selector knob, the meters, an LAPC indicator, and a remote-control signal sensor.

The SU-R1000 is not a streaming DAC; it has no Ethernet or Wi-Fi. What it does have is two pairs of brass speaker terminals that can be turned on or off independently, balanced (XLR) and unbalanced (RCA) analog inputs, and RCA connectors for pre out, main in, rec in, and rec out. There's an output for recording and another for driving a subwoofer. On the digital side of things, there are two USB inputs (labeled PC1 and PC2), and two each of S/PDIF RCA and TosLink digital inputs. The remote control controls pretty much everything on the SU-R1000.

Setup

I introduced the Technics SU-R1000 to my system using a 2m run of AudioQuest Robin Hood speaker cables mated, alternately, to the DeVore Fidelity O/96, Klipsch Forte IV, and Canton 7K loudspeakers. My Thorens TD 124/Jelco 350S 9" tonearm/Clearaudio Concept MC cart/Sculpture A Mini Nano Step Up came into play, and streaming files from Roon/Tidal via laptop, the latter using a Furutech 2M USB digital cable. I used the Ayre EX-8 2.0 integrated amp (100Wpc into 8 ohms, 170Wpc into 4 ohms) for comparison.

Before playing music, I set up LAPC and Intelligent Phono EQ using the enclosed calibration disc, paying close attention to the user manual and remote functions. The manual's descriptions are complex, but implementing its procedures is simple. As you engage the calibration disc and remote, the system emits a series of test tones over a period of minutes. The display screen updates the amp's progress, from "Measuring" to "Completed."

The Technics's SU-R1000 is a complicated product. I endlessly queried Frank Balzuweit and Bill Voss, pored over the company's white paper and website—which, though not without PR-speak, is helpful. Perhaps the most instructive thing—and what mattered most—was *listening* to the SU-R1000 in my reference system.

The sound of something new

The Technics SU-R1000 is not a class-D amp "on steroids," and it's not a solid-state amp emulating a tube amp. It's unlike any amplifier I've heard. The SU-R1000 achieved levels of performance and sound quality I've not previously heard from *any* amplifier, except in terms of tone and texture, where the E.A.T. E-Glo I and my Shindo separates bested it. The Technics SU-R1000 is a breakthrough product.

What first impressed me was the SU-R1000's immaculate separation of musical lines. Each instrument and vocal occupied a clear, spatially dense, immediate, dynamic, coherent, physical presence. Enabled by the amp's bottomless noisefloor, it was easy to closely follow melodic lines within (eg) complex orchestral material. I heard so deeply into recordings that I wanted to do nothing more than ride the soundwaves wherever they took me. I found myself thinking while playing familiar recordings: "*That's* on this record?" The SU-R1000 framed recordings, especially vintage vinyl, in their unique, historic time, to a greater extent than any amplifier I'd previously heard. Through the Technics, the constituent ingredients of each recording were shaped and arranged in seemingly perfect order as though snapped to attention by an invisible hand. The SU-R1000 may be technically complex, but its sound was simple, whole, and true with exceptional transparency, flow, and imaging.

The SU-R1000 *did* display a sonic signature. Its basic

sound, whether the source was digital or analog, was warm and a touch rich. Its character was like a drink before a meal: settling the stomach and palette, framing and infusing what's to come. Occasionally though, during vinyl playback, a guitar figure or cymbal crash would exhibit a slight, processed-sounding sheen.

The SU-R1000 is heavy on subtleties that add up to something that's not subtle at all. LAPC and Intelligent Phono EQ, for example, created different flavors of playback depending on the recordings and ancillary gear. LAPC added bass weight, presence, and smoothness. The Response Optimizer improved spaciousness and 3D soundstage depth; the Technics was almost tubelike in that regard. I kept LAPC and Response Optimizer engaged much of the time and found it added a silky touch and a bit of depth to recordings. The amp sounded a bit more powerful, open, dynamic, and transparent without these effects, but at a loss of soundstage width and depth, physicality of imaging, and sweetness. On the other hand, I heard little difference when I turned off the Crosstalk Canceller, perhaps owing to the very capable Clearaudio Concept cartridge.

The Technics unfurled Frank Sinatra's "It Gets Lonely Early" from *September of My Years* (16/44.1 FLAC, Reprise/Tidal) in nearly psychedelic sensations, the enveloping strings and brass line beautifully imaged and present. The song's left channel harp hung high above the system and to the far left, like some sprite watching overhead. It was spooky and a little startling.

I played "Every Hungry Woman" from The Allman Brothers Band's 1970 debut (16/44.1 FLAC, Atlantic/ATCO/Qobuz): Butch Trucks playing four-to-the-bar on his hi-hat during the intro and the overdubbed conga and the two separate bass drums of Trucks and Jai Johanny Johanson (aka Jaimoe) colliding and clamoring for sonic supremacy, presented as I'd never heard before. Greg Allman's vocal and organ were surrounded by air. The band snarled and bucked. This was time travel with the SU-R1000 as time machine.

Whether the source is vinyl or digital, on Pat Metheny and Charlie Haden's "Message to a Friend" from *Beyond the Missouri Sky* (16/44.1 FLAC Verve/Tidal), the lower register of Haden's bass can sound like a fat, overhanging blob. The Technics reproduced Haden's bass with exacting clarity, good tone, and sinewy texture—coherent, clean, and well defined throughout the instrument's range.

Steely Dan's "Godwhacker," from 2003's *Everything Must Go* (16/44.1 MQA, Reprise/Tidal), filled my listening room with a large-scale performance, physically imaged through the SU-R1000. Forceful drums, electric bass, guitars, and especially vocals were spacious, airy, detailed, and so very clear. It was as if Donald Fagen and his background vocalists were singing to me, alone.

Vinyl was just as robust and 3D through the SU-R1000, from the deep organ pedal bass of Jimmy Smith's *Softly as a Summer Breeze* (LP, Blue Note BLP 4200), to the intensified articulation and spaciousness of drums and tenor on Wayne Shorter's *Night Dreamer* (45RPM LP, Music Matters MMBST-84173). On Kirill Kondrashin's recording of Kalinnikov's Symphony No.1 in G Minor with the Moscow Philharmonic Symphony Orchestra (LP, EMI ASD 2720), the orchestra was presented with stirring speed and scale.

I was eager to hear how well the Klipsch Forte IVs (99dB, 8 ohms) would mate with the Technics integrated. LAPC benefited the Klipsch's midrange and treble horns, making them sound silkier and even more refined—the IVs were already a big improvement in this respect over the IIIs—while retaining the speaker's power, speed, and excellent dynamics. More information isn't always good: The IVs plus LAPC revealed previously unheard surface noise on my copy of Kalinnikov's Symphony No.1, but the music flowed in large swaths of microdynamics-rich sound, the orchestra undulating with power and speed. Again, the SU-R1000 made the most of vinyl and loudspeakers.

Next, I tried the Canton 7K loudspeaker. The Kalinnikov disc sounded great. The sense of spaciousness and separation was increased on Wayne Shorter's tenor on *Night Dreamer*. The SU-R1000's advanced phono features even seemed to smooth out pops and ticks on a 1955, red-vinyl copy of Cal Tjader's *Tjader Plays Mambo* (LP, Fantasy 3-221). On the other hand, Smith's *Softly as a Summer Breeze* sounded more transparent and alive *without* LAPC engaged.

I replaced the Technics integrated with the Ayre EX-8 2.0—my favorite integrated until I heard the SU-R1000—for a quick comparison. The Colorado kit did not fail to please. Streaming the Allman Brothers and Steely Dan from Roon, the Ayre boogied hard, sounding upfront and immediate. My air guitars were set in motion. But I missed the delicious refinement, spaciousness, clarity, transparency, and super detail of the SU-R1000. I'm an analog guy, but these digital technologies simply *worked*.

Conclusion

The Technics SU-R1000 Digital Integrated Amplifier provides nearly everything I could hope for in a contemporary integrated amplifier. It reproduces vinyl and digital files with high levels of transparency, dimensionality, spaciousness, and dynamics. Its various modern technologies actually, obviously *work*, allowing me to achieve the highest levels of realism I've heard in my circa-1865 listening space.

The Technics does not equal my reference Shindo amplification in the areas where they—the Shindo components—excel: tonal and timbral verisimilitude. Nothing else I've tried does; that's why they're still my reference. But the Technics was superior in every other way. The SU-R1000 is a technological breakthrough and a remarkable integrated amplifier. ■

ASSOCIATED EQUIPMENT

Analog sources Thorens TD 124 turntable, Jelco TS-350S 9" tonearm, Clearaudio Concept MC cartridge, Sculpture A Mini Nano Step Up.
Digital sources Asus laptop running Roon, Tidal.
Integrated amplifier Ayre EX-8 2.0.
Loudspeakers Canton 7K, DeVore Fidelity O/96, Klipsch Forte IV.
Cables Interconnect (RCA): Triode Wire Labs Spirit II, Shindo Laboratory. Digital: AudioQuest Forest. Speaker: AudioQuest Robin Hood. AC: manufacturers' own.
Accessories IsoTek EVO3 Aquarius line conditioner, Salamander five-tier rack; IKEA Aptitlig bamboo chopping boards (under preamp, turntable, power amps); mahogany blocks (2" × 2" × 0.5") under boards; 3"-thick studio-treatment damping foam on ceilings and walls.
Listening room 12' L × 10' W × 12' H, system set up along long wall; suspended wood floor, 6"-thick walls (plaster over 2×4), wood-beamed ceiling. **—Ken Micallef**