KENWOOD'S DIGITAL FLAGSHIP

Aspirational products from Kenwood: the L-1000 series CD player and pre/power-amplifier

by Paul Miller

A decade ago, Kenwood (then trading in the UK as Trio) used to head its range with a number of aspirational products known collectively as the 'L-O' series. For 1990-91, the L-series has returned in the form of a luxuriously appointed system comprising a new CD player and pre/power combination, with a matching digital tuner to follow.

Elegance is the key to this L-series, a theme realized by a subtle unification of build, technology and sound quality. The L-1000D CD player, for instance, is beautifully constructed with a diecast alloy facia, central drawer mechanism (culled from the DP-9010 transport), and the bare minimum of on-board facilities. By contrast, a full range of track and index location, programming and repeat facilities is available via the RC-1000D remote control. It is even possible to defeat the slim yellow fluorescent display, but only once the player is in operation – otherwise there's no indication that the unit is even switched on!

The matching L-1000C/M pre/power combination has parallel minimalist pretentions, with a similarly faultless standard of construction. Sophisticated logic-controlled selection is available for a variety of balanced and single-ended inputs and outputs. Exquisitely small LEDs indicate which input has been chosen, as do others catering for m-m/m-c cartridge and rec-out selection. Other beacons are provided for source-direct operation in addition to the (motorized) volume control. Add to this a matching IR handset and bass/treble tone controls, and the L-1000C begins to sound rather complex. Yet on acquaintance it is hard to imagine a more civilized pre-amplifier.

Technical description

The use of balanced circuitry to suppress the various forms of common-mode noise is extensive in the 1000-series. The pre-amp's disc input is initially single-ended, but matched inverting/non-inverting RIAA stages are used to generate a balanced feed which goes to the principal line stage (as do the other unbalanced inputs) via a bank of CMOS-controlled relays.

Comprehensive use has been made of JRC op-amps in all the line-level unbalanced/balanced gain blocks, including the balanced line output. Even Kenwood's active volume control is incorporated into a balanced gain stage, though the passive tone controls are not. Comprehensive RF input filtering is included, ensuring that the 1000C will satisfy the most stringent interference specifications.

The massive partnering L-1000M power amp has much of its bulk accounted for by two shielded 270VA mains transformers, a pair of huge 47,000μF reservoir caps, and a large diecast heatsink. Running very cool, this latter plays host to the five pairs of Motorola devices which form the bridged, complementary output stage. Inputs are provided, with L/R attenuators situated immediately after the inverting/non-inverting gain stage and before the balanced, bridged Class-A driver.

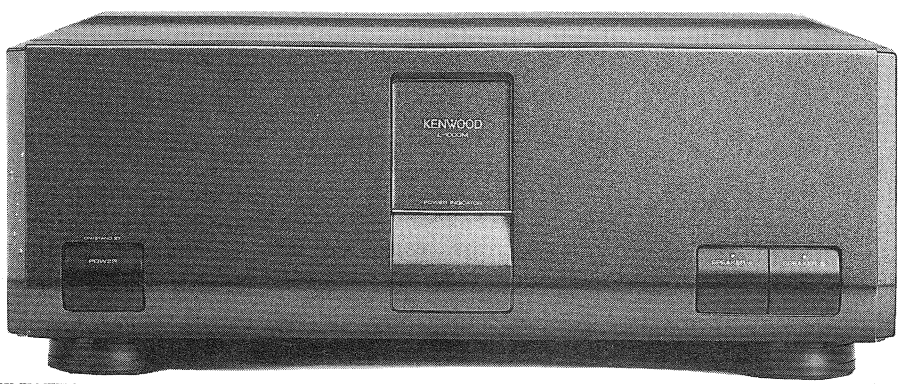
Yet it is the partnering CD player that holds most secrets. This is a unique and highly sophisticated design with two very special 16-bit integrating D/A converters – the pro-orientated CX20152 from Sony. Each of these DACs is in fact a multiplexed dual-channel device with independent shift registers, latch and counters for the 8LSBs and 8MSBs.

Here, any of 256 discrete amplitude levels (including 0) are switched on or off at any rate up to 255 times within each sample period. The data stream therefore emerges as a PAM wave prior to integration, which is akin to a multi-level version of PDM, offering good differential linearity but incurring very high speed glitches.

An external integrator is required to maintain the DAC output voltage during the subsequent deglitching period, which means there is a direct relationship between the maximum sampling frequency and available clock frequency. In the event, a clock frequency as high as 67.74MHz is required to process a 2-times oversampled serial data input.

Kenwood has extended the system by first incorporating a 293rd-order 4-times interpolating digital filter before dividing each 176.4kHz sample into one of four quadrants. These full-scale 16-bit words are addressed in sequence to each pair of multiplexed DACs, leaving sufficient settling time for each capacitor and discrete deglitching network.

Because of the exceedingly high clock rate, DAC conversion accuracy is highly critical of jitter. To an extent jitter is absorbed by an integral D-type latch which varies the output state in synchronization with the rise of the clock. Further to this, Kenwood has also arranged the master-clock to synchronize the timing of the sample-and-hold circuits with the latching of the four independent DACs.



Lab report

Kenwood's CD player fails to offer the amplitude linearity of the best bitstream/PWM systems, but although the errors of 1/2.4/3.3dB at −80/90/100dB respectively are all in the positive (compressive) direction, they are still acceptably small, while linearity remained within 0.1dB to below −60dB modulation. Channel separation and balance are superb, while A-wtd S/N extends to a fine 112dB on pre-emphasised discs. THD is low too, hovering around 0.0007% (−103dB) at mid-band and increasing only to 0.0032% (−90dB) at 20kHz. In-band frequency response remains within 0.1dB up to 20kHz.

But there are a few oddities in the ultrasonic performance of this player, not least in the emergence of extended-order IM products associated with leakage of the 88.2kHz oversampling frequency (−84.7dB). This is evident both on the −70dB plot (Fig.1) and the 3D spectrum (Fig.2), the latter revealing 3rd and 5th-order difference routes which extend directly into the audio band at −87.5dB. This is a feature of the integrating DAC, while by contrast the oversampling filter helps suppress 2nd-order stop-band IMD by a superb 105dB!

Ostensibly there's very little amiss with the L-1000C pre-amp, for it offers an intelligent blend of very high linearity, stereo separation of 75-85dB, and a maximum channel balance error of 0.25dB across a 60dB range. All the unbalanced input sensitivities are fine, though the 28dB headroom (ref IHF) and 75dB A-wtd S/N on the m-c input are less impressive – relatively speaking – than those of the corresponding m-m stage. The associated RIAA equalization curves (Fig.3) also differ slightly at the frequency extremes.

The L-1000M power amp generously exceeds its specification, offering some 190W into 8ohms with a rise of 1.9dB (296W) into 4ohms. The 0.06ohm output impedance is acceptable, though Kenwood's over-zealous protection circuitry (placed between the Class-A drivers and A/B output stage) limits the maximum pulsed current to just 16.2A (1ohm). THD is typically below 0.002% (−94dB), and a 3D plot revealed only the merest hint of audio IM. But the amp is not entirely free of RF IM effects, proving susceptible to noise in the 750MHz region (Fig.4), while the positive phase-shifts across the audio band are somewhat bizarre.

Sound quality

With due regard to the likely price and position of this combination, Kenwood withheld its release for nearly a year, opting instead to spend the time teasing-out any shortcomings and generally polishing the overall performance. As a result the combination has come to enjoy what can only be described as a smooth, homogeneous sound that remains consistent from input to input. Both the phono and unbalanced line inputs offer signals that are at once highly refined, smooth, and free of grainy colorations.

This very civilized demeanour comes into its own when reproducing the innocuous modern jazz of, say, Bob Berg. The plain but taut bass of *In the Shadows* was accurately depicted by the Kenwood combination, dry and technically faultless if perhaps lacking the fruity resonance of the 'real thing'. Sax and percussion were also depicted cleanly, detailed, pure in tone and free from any harsh edginess.

Yet faced with a recording that embodies a little more 'spirit', the technical precision of this combo can result in a sound that – while undemanding and pleasant – is also slightly bland. *Mood Indigo* (Gemini Records) exemplified this trait: the beautifully rich character of the clarinet, though offered up with startling clarity, managed to lose a little of its intimacy. Each performer was clearly resolved, the timbral nuances of each instrument described with a smooth, delicate touch; yet as a whole they failed to pull together, diluting the strength and passion that lay bubbling beneath the music's architecture.

In this respect I was reminded of the Denon DCD-3560, another complex multi-bit player which offers a superbly controlled and focused sound, but lacks real emotional bite. However, this is not necessarily a reflection of the technology, for Technics' bitstream SL-PS70 provides a similarly uncommitted view of dynamic contrasts. In short, the Kenwood 1000 series could end up sounding rather insipid if partnered with overly-rich or reticent-sounding loudspeakers.

It is, however, in their intended *balanced* mode (CD player to pre-amp and pre-amp to power amp) where the soul behind these monoliths of engineering begins to stir. In spatial terms its presentation took on added breadth and depth, while tonally it appeared to enjoy equal gains in extension and transparency. The sound was cleaner as stereo images broke free from the speakers with renewed conviction and tactility, immersed in an easier, more fluid and ambient acoustic.

In isolation these changes didn't represent large gains in quality, but their combined influence gave rise to a sound that sparkled in a manner previously only suggested. The units shed their mechanical proficiency for a vibrancy that now permitted a better view of the commitment behind the music. Returning to *Mood Indigo* provided an opportunity to relish the luxuriant tone of the clarinet and sax as well as to enjoy a performance that seemed both more immediate and more personable.

Similarly, the 'Triumphal March of the Devil' from Stravinsky's *Soldier's Tale* was just that – alarmingly boisterous and confident, with the rasp of trumpet announcing the final and wonderfully ambient ricochet of sidedrums. Without doubt, in their balanced mode these units conjoined their dry, technical competence with a genuine sense of occasion and atmosphere. The result was uniformly civilized, yet thrilling to boot.

Conclusions

It would be uncharitable to suggest that Kenwood has simply endeavoured to produce a combination that is all things to all men. Yet by striving for a highly neutral sound there is a tendency, in raw musical terms at least, for it to appear self-effacing or even featureless.

Nevertheless, the L-1000 units are highly dependable and predictable performers, harbouring no insidious foibles waiting to emerge after purchase. Indeed, anyone attracted to the delightful smoothness of this combination with one piece of music is likely to be similarly entertained by all that follows.

Furthermore, beautifully crafted both inside and out, this latest Kenwood 1000 series is a combination that enjoys a genuinely symbiotic relationship. Split them up, and the consistency so diligently pursued by Kenwood would be scattered to the winds.

KENWOOD 1000 SERIES

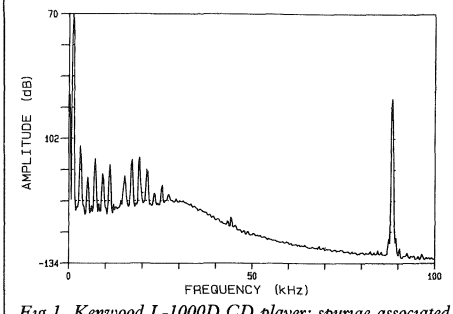


Fig 1 Kenwood L-1000D CD player: spurıae associated with 1kHz tone at −70dB

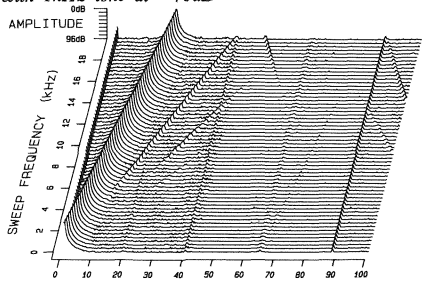


Fig 2. Kenwood L-1000D CD player: ultrasonic spurıae arısing from a swept 0-25kHz tone

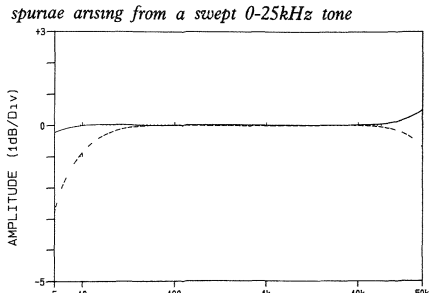


Fig 3 Kenwood L-1000C pre-amp: disc equalization errors, m-m plains line, m-c dashed

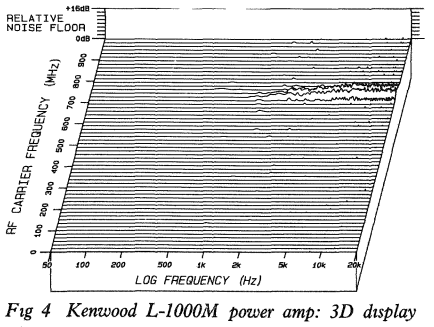


Fig 4 Kenwood L-1000M power amp: 3D display of RF spurıae

Test results	L-1000C pre-amplifier		
	Aux/CD	m-m	m-c
Stereo separation (20Hz)	84 1dB	84 2dB	84 5dB
(1kHz)	79 3dB	79 7dB	81 5dB
(20kHz)	74 9dB	77 7dB	79 2dB
Channel balance (1kHz, 0dBV)	0 02dB	0 04dB	0 01dB
(−20dBV)	0 19dB	0 18dB	0 16dB
(−60dBV)	0 27dB	0 25dB	0 24dB
THD (0dBV, 1kHz) (dB)	−100 3	−105 7	−104 0
(20kHz)	−98 0	−101 5	−87 9
CIIR intermod distortion (1 1)	−99 8dB	−75 3dB	−74 3dB
Phase shift (20Hz)	+25°0′	+3°30′	+5°30′
(1kHz)	0°	−48°30′	−48°30′
(20kHz)	−10°30′	−90°0′	−100°30′
Noise (A wtd, 20Hz 20kHz)	−104 8	−92 1dB	−74 7dB
Residual noise (unwtd) (dBV)	−102 4	−102 7	−102 6
Input sensitivity (for 0dBV)	149 5mV	2 368mV	193 1μV
Disc overload (20Hz)	—	16 78mV	1 395mV
(1kHz)	—	157 0mV	12 66mV
(20kHz)	—	1439mV	121 7mV
(50kHz)	—	2995mV	291 5mV
Input loading	48k ohm /520pF	45k ohm /290pF	103ohm
Squarewave linearity	−96 3dB		
Pre amp output (max)/ impedance	10 08V (disc)/102ohm		
Tape output (max)/impedance	9 886V (disc)/283ohm		
Typical price (inc VAT)	£600		

Test results	L-1000D CD player		
	20Hz	1kHz	20kHz
Channel balance	0 01dB	0 02dB	0 07dB
Stereo separation	122 5dB	123 5dB	105 1dB
Channel phase difference	–	(30′ at 10kHz)	2°50′
THD 0dB (dB)	−102 9	−102 9	−89 9
THD −10dB	—	−101 2	
THD −30dB	—	−76	—
THD −60dB	—	−49 6	—
THD −90dB dithered	—	−16 8	—
Intermod (CCIR) 0dB		−86 5dB	
Intermod (stop band suppression)		104 9dB	
S/N (A wtd) without emphasis		108 5dB	
with emphasis		112 2dB	
	1kHz	5kHz	16kHz
De emphasis (error in dB)	+0 02	+0 04	−0 1
Resolution at −90dB (L/R)		+2 4/+1 6dB	
−100dB (L/R)		+3 3/+2dB	
Peak O/P level		1 99V	
Output impedance		37 9ohms	
Track access time		3 1secs	
Typical price (inc VAT)		£800	

Test results	L-1000M power amplifier		
	20Hz	1kHz	20kHz
Maximum continous power output, 8ohms	181 0W	189 5W	186 1W
4ohms	288 8W	296 3W	292 9W
Phase shift	+3°	+11°	+43°
Output impedance (ohms)	0 067	0 062	0 099
Damping factor (ref 8ohms)	120 2	128 4	80 5
Stereo separation (0dBW)	129 2dB	103 6dB	78 5dB
THD (0dBW) (dB)	−93 0	−95 8	−93 1
(⅔ power)	−100 3	−101 7	−91 9
CIIR intrmod distortion (0dBW)		−86 7dB	
CCIR IM distortion (⅔ power)		−87 8dB	
Rise time (at 10kHz)		1 5μsecs	
Dynamic headroom (IHF)		+1 2dB (251W)	
Noise			
(A wtd, 20Hz 20kHz) 0dBW		−96 2dB	
(A wtd, 20Hz 20kHz) ⅔ pwr		−115 5dB	
Residual noise (unwtd)		−84 4dBV	
Input sensitivity (for 0dBW)		79 7mV (unbal)	
(for full output)		1111mV (unbal)	
Input loading		50 3k ohms/650pF	
DC offset (L/R)		+6 1mV/+5 9mV	
Typical price (inc VAT)		£700	

Supplier

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