KENWOOD DP-X9010

After the successful launch of both the Arcam and Musical Fidelity outboard D/A converters the introduction of complementary transport-only CD players became inevitable. First off the mark, in this country at least, is Kenwood with the luxurious DP-X9010

by Paul Miller

If at first glance, the '9010 appears to be rather lacking in facilities, this is a deceptive effect of the styling, which gives this machine a solid and purposeful air. The disc tray withdraws into the centre of the machine with a reassuring 'clunk', while a bold fluorescent display above indicates all the relevant track, time and index information. Remember, the DP-X9010 is just like a high-quality CD player but lacking in oversampling filters and a D/A converter. The coaxial and optical outputs provide a digital data stream that must be converted into analogue by an ancillary unit, such as the Arcam Black Box or Musical Fidelity Digilog.

Although the only other controls on the chunky black facia are stop, play/pause, fast music search, track skip and all-repeat, the DP-X9010 comes with a comprehensive remote control that adds many other facilities.

Kenwood has resorted to a laminated construction for the case and has incorporated four sprung feet in an effort to reduce the ingress of vibration. Furthermore the laser sled has been increased in mass from typically 65g to 175g while the shaft cavity is fashioned from a sintered molybdenum alloy together with traces of jet oil to ensure friction-free movement. Even the circuit boards are isolated on little plastic mounts!

Kenwood has relied fairly heavily on established Sony electronics in the design of the DP-X9010, but this has not prevented the company adding a few upmarket 'tweaks' of its own. For instance, though the player has only one shielded mains transformer it features multiple secondary windings and separate rectification/regulation for the RF amp, disc motor, sled and tracking servos on the one hand and system control, EFM and data/clock regeneration circuits and output retiming gate on the other. Centralized earthing points are also found on the servo, processing and digital output sections' printed circuit boards. Current-to-voltage conversion and amplification of the quadrature RF signal derived from the laser head is accomplished using Sony's CXA10B1 processing IC. This chip also handles the focus and tracking error components, which are derived from the three-beam laser and transmitted to the CXA1244 servo signal processor. Tracking, focus and laser-sled control (including random play) is determined here, the IC responding within 0.5msec for a one-track jump.

One of Kenwood's little tweaks concerns the output from the sled sensing-coil, which feeds a balanced input (two 4550 op-amps), thereby reducing any earth-line noise by the common-mode rejection ratio. A rejection of around 80dB is likely assuming a servo frequency of about 2kHz. This 'BTL' sled-drive together with the focus and tracking drive circuits is composed of both 4558 op-amps and several pairs of discrete devices.

The RF output, or eye-pattern, from the four main spot detectors (A+B+C+D) is summed in the RF amp before being converted back into an EFM logic signal at the input to the CXD1125 digital signal processor IC. A transmission clock of 4.3218MHz is regenerated by an internal PLL and VCO from the EFM signal and this is used to extract the 7.35kHz frame sync signal via a 23-bit shift register. During the recording of a CD, each 588-bit information frame is initialized with a sync word, giving a frame frequency that is determined by the final bit rate of 4.3218MHz divided by 588=7.35kHz.

Because the long-term data rate from the disc must equal the internal clock rate, this frame sync signal is used as a timing reference for the CLV servo (controlling the spindle motor), via the large NEC D75212A CPU. Depending on the disc the absolute linear velocity required may vary between 1.2 and 1.4msec^{-1}, but this is not as important as maintaining a constant velocity and therefore the correct sample rate. Anyway, the signal processor also executes the 14- to 8-bit demodulation, subcode demodulation (P through to W) and error detection/interpolation in conjunction with an external 2048x8-bit SRAM (Sony CXK5816).

Lab report

Fig. 1 shows the bit repetition signal produced by the coax digital output of the DP-X9010 and isolated at the input to the MF Digilog. The disc bit rate of 4.3218MHz is reduced to 1.4112MHz (2 channels with 16-bit coding sampled at 44.1kHz) at the digital output after removal of the sync word, EFM, control word and CIRC decoding so the 1.41525MHz measured here must include room for additional subcode flags (de-emphasis, etc).

The edges of this signal are free from jitter and with a rise time of around 7nsecs are some 2-3 times faster than most other digital outputs. The edge-triggered devices used in both the Black Box and Digilog will experience no difficulty in synchronizing with this input though the ringing atop the waveform is likely to introduce secondary effects.

Fig. 2 shows the leading edge of the repetition signal with ringing due to an RF resonance in the digital o/p transformer.

This RF resonance is centred on 75.8MHz and has a peak-to-peak voltage of 104.4mV (or 0.49mA RMS RF current into 75ohms) using Kenwood's own 75ohm RF coax. Fig. 3 demonstrates the effect of using an unshielded and impedance-mismatched audio cable (lower) instead of a good RF coax (above), the former exacerbating the RF resonance.

Fig. 4 represents the residual RF noise derived between the case and electrical ground inside the DP-X9010. Every time there is rapid change in the repetition voltage (every 'edge') this stimulates a resonance in the o/p transformer. As there are two edges per 1.415MHz this stimulates the 75.8MHz resonance at a 2.83MHz repetition rate as shown. This pulse is well-damped on the signal line but is less so in the earth plane where the high RF impedance causes an appropriately high voltage to flow.

I have not witnessed such a high level of spurious RF from any other digital o/p and this may have certain subjective repercussions. Theoretically at least, amplitude modulation of any RF component by the audio signal (within any subsequent piece of analogue equipment) may result in broad-band IM products manifesting back in the audio band. Demodulation is the key here, aided by open loop non-linearities and/or non-linearities in passive components.

Sound quality

I will say at the outset that my subjective experience of this unit has been one of general delight tempered with moments of sheer frustration. Comparing the coaxial digital output of the Kenwood with that of the Marantz CD65II, using a Musical Fidelity Digilog, the improvement in transparency, bandwidth extension, and detail resolution was quite unmistakable. But along with this renewed musical insight and expressiveness was an odd graininess, a highlight that persisted in drawing my attention to musical activity in the treble registers. Where the Marantz had sounded smooth, if with some loss of crisp clarity, the Kenwood sounded both lightning-fast and slightly over-impressive. This characteristic was both immediate and obvious, and was witnessed by other listeners, including some unwitting volunteers who were subjected to further blind listening tests.

At its best the Kenwood was able to trounce any other transport with consummate ease. Take Moving Hearts' 'The Lark' for instance; here the low bass extension of the DP-X9010 lifted it clear of my usual Technics, Denon and Marantz players; the pounding energy of the floor toms and drums was conveyed with such tactility that it becamse possible to pin-point their exact source instead of getting some vague ideal of positioning from a wash of bass.

Similarly, the piano from Ellington's 'Satin Doll' played by the Knud Jorgensen Trio (Opus 3) was resolved with exquisite precision, flanked by the steady rhythm of bass on the one side, the brush of percussion of the other. Even the murmurings of the performers, often drowned out with other transports, were revealed with sparkling clarity from behind the instruments in a wide, deep and quite uncompressed soundstage.

That was at its best: with some other discs, a cold and fatiguing coloration was manifest, seemingly not precipitated by those recordings I have already mentioned. 'Lying' by Yello provided a succinct example. The vocals on this track still sounded rather more acerbic and sibilant than they had with the Marantz for example, the percussion also sounded 'glazed' and icy-cold. Even the metallic percussion and steel guitar from Tracy Chapman's 'Fast Car' seemed unduly highlighted. The presentation was finely detailed but the top end was unusually brash and uncomfortable. With this track at least, all the participating listeners preferred the lower-resolution but smoother delivery afforded by the Marantz.

I have made no mention of the subjective differences between the optical and coaxial linkages because, using the quality RF coax, I found that there was little to choose between them. Nevertheless, it is conceivable that the piggy-back RF noise was the dominant factor in determining the absolute fidelity of the two outputs, the preferred RF cable providing a similar degree of RF filtering as the optical linkage. By the same token, I could detect little or no benefit from turning off the fluorescent display; clearly any interference generated here would be swamped by the noise generated at the digital output itself.

Conclusion

It seems almost perverse for a company such as Kenwood, which has been at pains to promote the concept of clean ground lines, to have its star product compromised by a huge dose of RF noise. In defence, my surmise that this RF resonance is related to the audible treble colorations is only reinforced by my colleagues' very positive reaction to the DP-X9010 in other systems. EMC is something that, by its very nature, will vary from system to system. For now I am confident this problem is little more than a passing hiccup. Once this aspect of performance has been addressed, Kenwood may rightly lay claim to the title of state-of-the-art transport.

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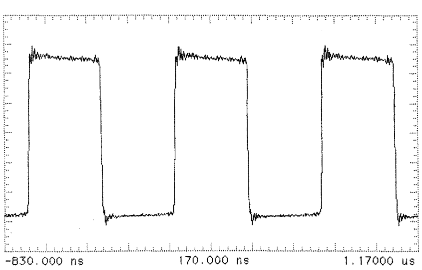

Fig. 1. Kenwood DP-X9010: bit repetition signal at the co-axial digital output (200ns/div)

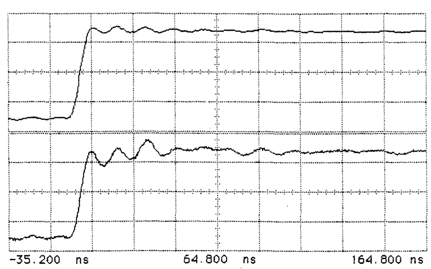

Fig. 3. Kenwood DP-X9010: effect of matched (above) and unmatched, unshielded cable (lower) (20ns/div)

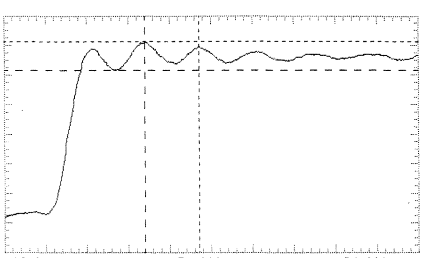

Fig. 2. Kenwood DP-X9010: Leading edge of repetition signal (10ns/div)

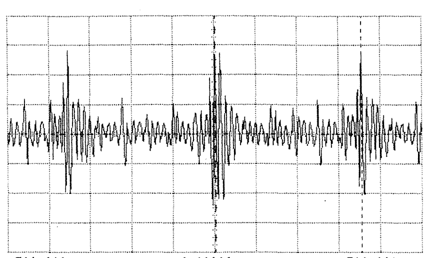

Fig. 4. Kenwood DP-X9010: residual RF noise derived between case and internal ground (100ns/div)

Test results

Digital output (coaxial)	633.325mVp-p
Digital output (optical)	−15.5dBm
Output impedance	75ohm
Clock/repetition rate	1.41525MHz
Rise time	<6.786nS
Error correction capability, dot	>800μm
Error correction capability, gap	>900μm
Access time (track 99)	1.7secs
Dimensions (whd)	44×13×36cm

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