

"Performance far better than practically every other machine on the market." — Louis Chaloff

# HARMON KARDON HK 1000 Cassette Recorder

IN THE FIELD of hi-fi, equipment development is an ongoing process. For some devices, such as amplifiers, perfection is virtually within sight and a great deal of effort is now spent on improving facilities rather than performance. Record players too are now practically as good as they need to be and a machine bought today will not be technically obsolete in five years time.

But cassette recorders and tapes are

very much in the throes of a development period and many a machine that was technically brilliant two years ago — or even one year ago — may now be well and truly surpassed by later products from its own and other manufacturers.

When for example, we reviewed Harmon Kardon's CAD5 recorder some two years ago, we found that it had the best technical performance of any cassette recorder reviewed up to

that time. Its frequency response was virtually unchallenged by any other machine, and the facilities that it had to offer, together with its overall performance were extremely good. Yet now, a mere two years later, Harmon Kardon's new HK 1000 is a vastly different and generally much improved machine. Its performance is superior to the CAD5 in all respects except one.

The HK 1000 is a particularly

attractive machine. It features a wooden base with teak veneer and a deck section which is basically a black plastic moulding with inserts of satin brushed anodised aluminium with black engraving.

Overall frontal appearance of the deck is particularly neat. It is laid out in three distinct sections. At the top, above the cassette well, is a three digit counter with reset button. To the right of this is a raised and sloping panel. This contains two VU meters together with a red coloured bezel to indicate the record mode, and a yellow coloured bezel to indicate the operation of the Dolby noise reduction system. In the centre of the deck, on the left hand side, is the cassette well (with a mirror in the centre to clearly show the extent of tape usage). On the right hand side of this are two slider controls for record level together with a recessed left and right channel record calibrate screw potentiometer. In the middle, at the top, is a test button for the oscillator signal for testing the Dolby record level mode, and on the right hand side are two playback level slider controls. These are also flanked by a recessed playback calibration control potentiometers, of which we will have more to say later.

On the lowest and frontmost section of the deck are from left to right, seven lever switches for cassette eject, fast rewind, record mode, one and a half times normal width stop button, normal play mode switch, fast forward mode switch, and a pause switch which has a locking position.

In the middle of the deck are two tip and sleeve microphone sockets flanked above by their very small respective microphone level potentiometers.

On the right hand side of the deck is stereo/mono switch, a standard tape, noise tape, chromium dioxide tape selection switch, a memory on-off switch, a Dolby noise reduction on-off switch, a self illuminated bezel power switch, and below it, at the front in the right hand corner, a tip ring and sleeve headphone jack which allows monitoring of the recorded signal without a main amplifier.

At the rear of the unit, on the left hand side, there is a fuse receptacle, and the power output lead, which in the case of this unit is a two core flex and American style two pin plug. On the right hand side of the rear of the deck, inserted behind the actual cabinet, are the two RCA type co-axial output sockets, a slotted head for the motor speed adjustment potentiometer, and four input sockets for respectively, low impedance inputs of 50 mV, and two high impedance inputs for 200 mV input.

One of the features of the machine

which warrants special comment, and possible criticism ergonomically, is the provision of the record and playback calibration potentiometers recessed behind the front panel and readily accessible. Harman/Kardon point out that this is a special facility and claim that there are definite advantages to be gained from having ready access to the Dolby set-level controls particularly if one purchases one of the "Dolby Reference Cassettes". Their philosophy is that the user has inbuilt facilities to optimize the Dolby system in the recording mode for every type of tape.

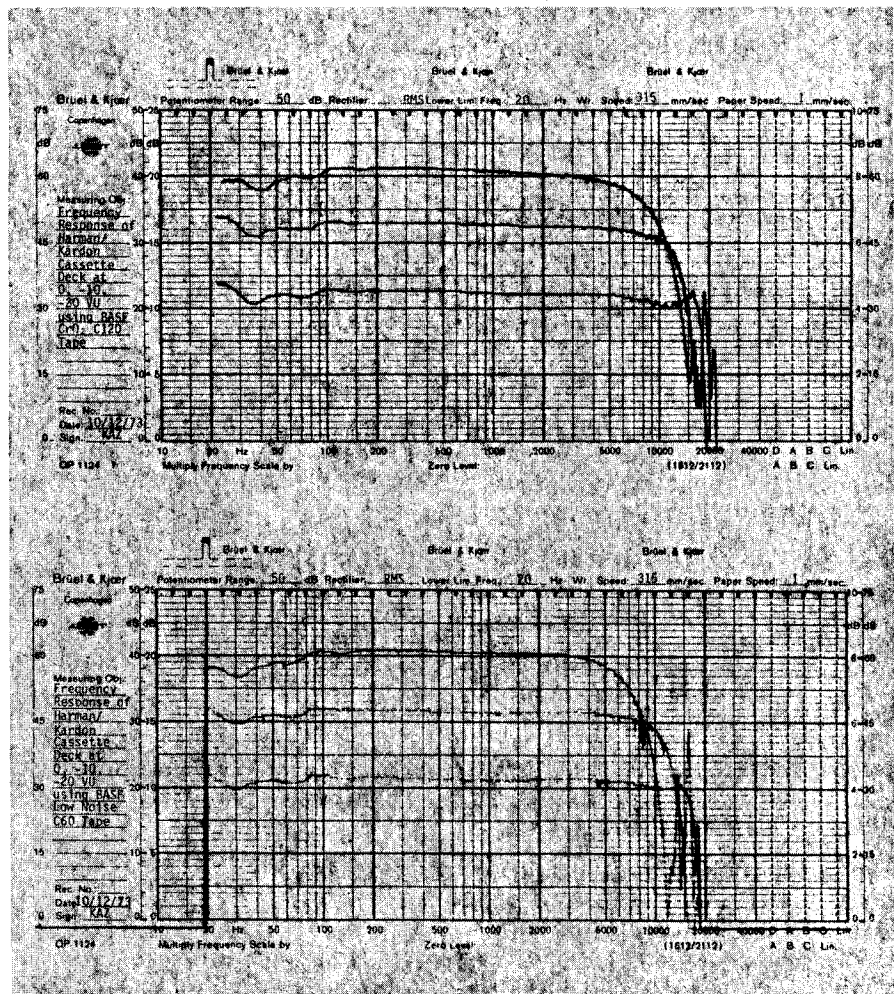
This adjustment is done using an internal calibration signal which is recorded on the tape. Any adjustment then required is made using the record calibration controls and the procedure repeated to check the new setting. Calibration is only required if a new type of tape is being used. As delivered, the machine is correctly adjusted for playback and the playback calibration controls (which are located on the front panel) should only be adjusted using the special calibration tape supplied by Harman/Kardon. This calibration is already performed in the factory and should not be necessary in normal use.

The HK 1000 is a particularly easy machine to use. It does not have any fickle or special controls over and above those provided by other medium priced machines — apart from the record and replay calibration controls — yet it can provide a very high level of performance.

The machine has obviously been designed for easy servicing and most of the printed circuit cards used are mounted with plug and socket connections to facilitate removal, checking, and if need be, replacement. The standard of the electronic wiring is particularly good. The nine printed circuit boards are clearly labelled on the component side with component numbers incorporated. The cards themselves are clearly designated with their purpose and operation.

An internal feature that we particularly liked was that the main transformer is well shielded. A mu-metal wrapping is used to reduce residual magnetic leakage.

The handbook was not up to the same standard as the machine itself, nor as good as those provided with other high fidelity equipment manufactured in Japan. It does provide operating details, but no circuit diagram is provided.



A good feature which is clearly noticeable when the unit is removed from its cabinet is the very effective automatic motor and mechanism shut off. This is operative in both the play, fast forward, and rewind modes.

## MEASURED PERFORMANCE

Our first test was to measure the performance of the unit with chromium dioxide and standard gamma ferric oxide tape at 0 VU, -10 VU, and -20 VU.

The performance under these conditions was particularly creditable at -10 VU and -20 VU. In fact this was virtually the first machine, apart from the Nakamichi 1000, where the performance with gamma ferric oxide tape was of the same order as that obtainable from chromium dioxide. Without any special adjustment the machine turned out a very creditable 20 Hz to 16.5 kHz +3 dB at -20 VU.

Harman Kardon make a strong selling feature of this machine's ability to provide an almost flat frequency response between 20 Hz. and 100 Hz. This claim is justified and the low frequency performance is better than most reel to reel machines, let alone most other cassette recorders that we have measured.

Total harmonic distortion was quite acceptable at 1 kHz and 6.3 kHz, but was considerably higher than normal at 100 Hz.

On the machine tested it was 10% at 0 VU.

Intermodulation distortion was particularly low, and even at 0 VU was considerably better than obtained from other cassette recorders.

Signal to noise ratio was extremely commendable. At 0 VU with a 1 kHz signal (without Dolby) it was -52 dB. With Dolby it was -54 dB.

'A' weighted it was -56 dB (A) without Dolby and -58 dB(A) with Dolby. These figures are even better than those provided by the Nakamichi 1000, and are easily the best that we have yet seen with Dolby and DNL.

The erase ratio for a 1 kHz signal pre-recorded at 0 VU, was -70 dB. This is the best erase ratio that we have yet measured on a cassette recorder.

Cross talk figures are quite acceptable, being 40 dB at 100 Hz and 45 dB at 1 kHz.

Wow and flutter figures are reasonably good being 0.17% on the unit tested compared with the manufacturer's specification of 0.13% or less.

Line input sensitivities were respectively, 18 mV for the low signal low impedance input, and 150 mV for the high impedance high sensitivity input.

The microphone sensitivity was 0.2

mV for 0 VU whilst the line output sensitivity is 1.4 volts. This is a substantially higher output than stated in the handbook.

The most interesting feature of the HK1000 is one of the techniques used to obtain the extended frequency response. This is achieved, in part, through the use of a replay head which is not inserted as deeply into the cassette body as it is in other machines.

This modifies the angle of contact between the head and tape so that the extent of magnetic coupling at the fringe of the gap is reduced and thus the "effective gap width" is reduced.

The penalty that is paid for the reduction in effective gap width is a simultaneous reduction in the stability of the contact pressure between the tape and the head with certain brands and types of magnetic tape.

This can and does result in these tapes lifting slightly from the head and results in a loss of replay signal level. The problem can of course be obviated by suitably selecting tapes.

On a theoretical basis it can be

shown that there is a 55 dB loss per wave length of spacing between the tape and head. At 7.5 kHz the recorded wave length is 0.25 mil, thus a tape head spacing of only 0.025 mil (which is not very much) will result in a drop of signal of 5.5 dB.

The performance of the HK 1000 is good — in fact with normal programme material it is particularly difficult to tell the difference between the original and the replayed material.

Frequency response is really excellent but, on the machine tested at least, this was achieved at the expense of tape/head contact. This failing — and this failing only — precluded our rating it as the second best recorder that we have ever reviewed.

Nevertheless it is a very good machine indeed and most of the performance parameters are far better than found in practically every other cassette machine on the market.

It is not as good as a Nakamichi — but comes much closer than its 60 to 70 per cent lower price would seem possible.

### MEASURED PERFORMANCE OF HARMAN/KARDON HK1000 SERIAL NO. 30364034

#### Record to Replay Frequency Response

With BASF CrO<sub>2</sub> Tape at:

0 VU	20 Hz — 6 kHz ±3 dB
-10 VU	20 Hz — 12 kHz ±3 dB
-20 VU	20 Hz — 17 kHz ±3 dB

With BASF -C60 Tape at:

0 VU	20 Hz — 6 kHz ±3 dB
-10 VU	20 Hz — 10 kHz ±3 dB
-20 VU	20 Hz — 16.5 kHz ±3 dB

#### Intermodulation Distortion

(at 1kHz and 960 Hz):	0 VU	0.4%
	-10 VU	0.2%

Signal to Noise Ratio	with Dolby	without Dolby
(CrO <sub>2</sub> tape + Dolby	54 dB (Lin)	52 dB (Lin)
0 VU re 1 kHz)	58 dB (A)	56 dB (A)

Erase Ratio for 1 kHz Signal  
(Pre-recorded at 0 VU) -70 dB

Cross Talk at 0 VU:	100 Hz	40 dB
	1 kHz	45 dB

Wow & Flutter % — Weighted: 0.17%

Line Input Sensitivity for 0 VU (Low)	18 mV
(High)	160 mV

Microphone Input Sensitivity for 0 VU 0.2 mV

Line Output Sensitivity for 0 VU 1.4 V