XG-7003 PICKUP TEST II

--Mechanical impedance measurement / Reference level--

(SIDE A) MECHANICAL IMPEDANCE MEASUREMENT

This side contains sine wave signals with the recording level as shown in Table 1, of frequencies from 16 kHz to 31.5 Hz alternatively in the left and right channels, which enable to measure the mechanical impedance of pick-ups. The condition for a stylus pressure (weight) W to be able to trace the record groove without jumping is:

$$W \geq \frac{\sqrt{2}}{g} |Zm| \cdot Vp$$

where g is the acceleration of gravity (app. 980 cm/s^2), Zm is the mechanical impedance, and Vp is the peak velocity in 45° direction. It follows that the critical stylus pressure Wc at which jumping (usually "skating") is just about to occur, gives:

$$|Zm| = \frac{980}{\sqrt{2}} \cdot \frac{Wc}{Vp} \text{ (dyne . sec/cm)}$$

The velocity for this band has been chosen to have a value which make ready to calculate mechanical impedance, so that once the critical stylus pressure Wc has been determined by inspection of the waveform on an oscilloscope, etc., the mechanical impedance can be simply calculated as shown in Table 1. For example, for the critical stylus pressure 0.45g at a frequency of 1 kHz, the mechanical impedance $|Zm| = 0.45 \times 100 = 45$ (dyne. sec/cm) so the calculation is simply performed. Further, when an inside force presents, the stylus jump first occur on right channel groove wall. For a precise judgement of incipient stylus skating, therefore, it requires tracking error free alignment in both the horizontal and vertical directions.

Ordinally, the compliance only is regarded as the quantity for expression of tracing ability (or trackability), but it is only true at frequencies lower than a few hundred Hertz where the compliance dominants the mechanical impedance. When the mechanical impedance is high at the mid-frequency, where musical signal levels are higher, a high mechanical impedance will cause the stylus to jump from the groove, and at higher frequencies

it will result in a "re-cutting" phenomenon.
The compliance c_c may be derived from the mechanical impedance for midfrequincies (125 Hz to 500 Hz) by the following equation:

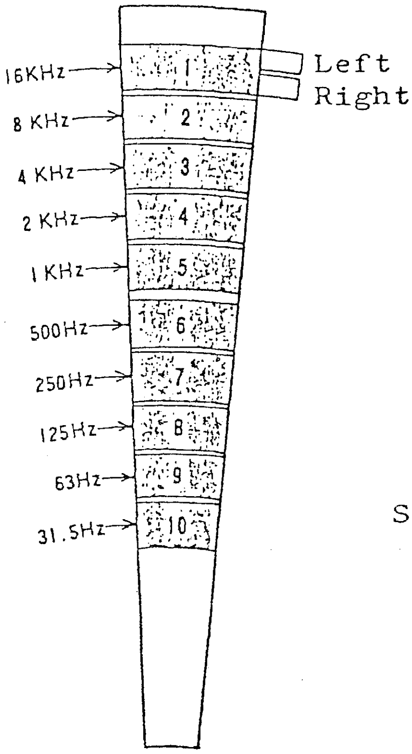
$$c_c = \frac{1}{2\pi f . |Zm|} \quad \text{(cm/dyne)}$$

Frequency and recorded posision are shown in Fig. 1.

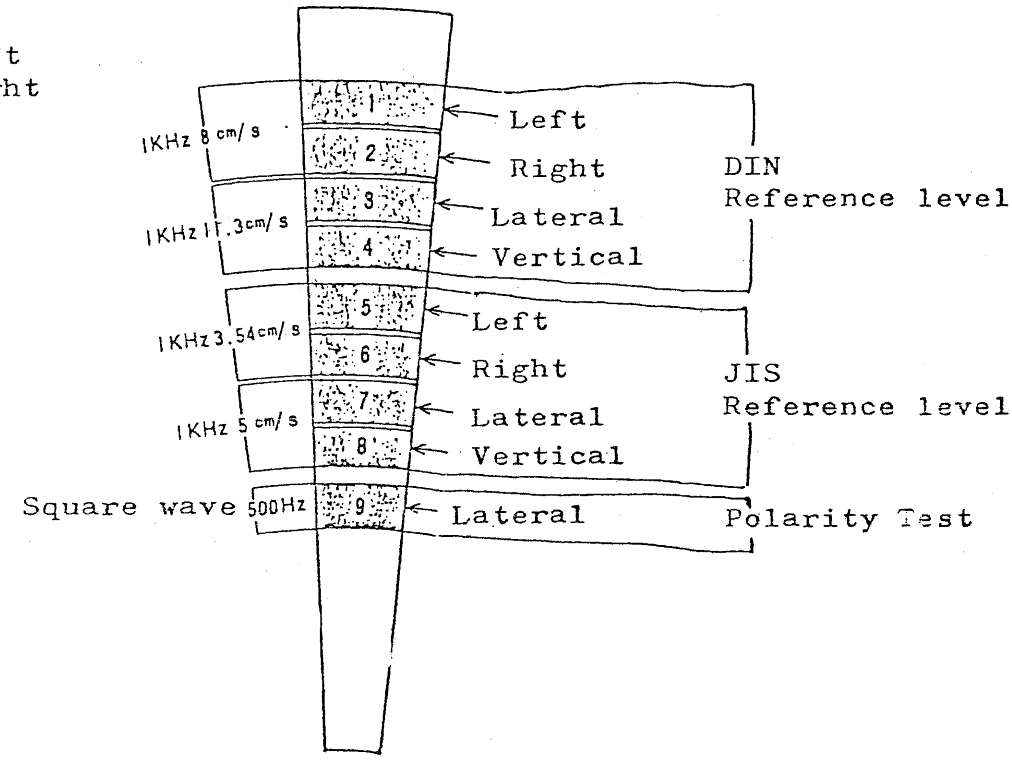
(SIDE B) REFERENCE LEVEL

This side contains two reference levels based on DIN and JIS standards, and square wave signal for inspection of cartridge polarity. The signals of band 1 to 8 are sinuscidal waves. Fig. 2 shows the signal frequencies, recording level and recorded position of each band. The velocity amplitudes shown are all peak values. As shown in Fig. 3, the Duty 3:7 500 Hz square wave signal is recorded in the lateral direction in band 9. The polarity of this groove is considered to be +(Plus) when it deviate to the outside.

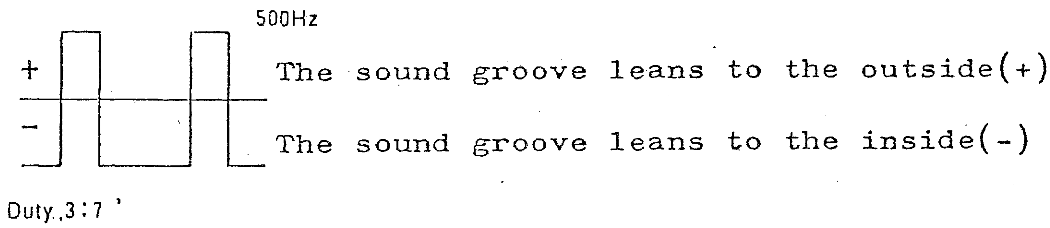
(Fig-1) Side A



(Fig-2) Side B



(Fig-3) Recorded waveform of square wave



(Table-1) Caluculation of mechanical inpedance

frequency (Hz)	recording level (cm/sec. peak)	mechanical impedance (dyne-sec./cm)
16 K	$\frac{9.8}{\sqrt{2}} \times \frac{1}{2} =$ 3.47	200 x Wc
8 K	$\frac{9.8}{\sqrt{2}} \times 1 =$ 6.93	100 x Wc
4 K	= 6.93	100 x Wc
2 K	= 6.93	100 x Wc
1 K	= 6.93	100 x Wc
500	= 6.93	100 x Wc
250	= 6.93	100 x Wc
125	$\frac{9.8}{\sqrt{2}} \times \frac{1}{2} =$ 3.47	200 x Wc
63	$\frac{9.8}{\sqrt{2}} \times \frac{1}{4} =$ 1.73	400 x Wc
31.5	$\frac{9.8}{\sqrt{2}} \times \frac{1}{8} =$ 0.87	800 x Wc