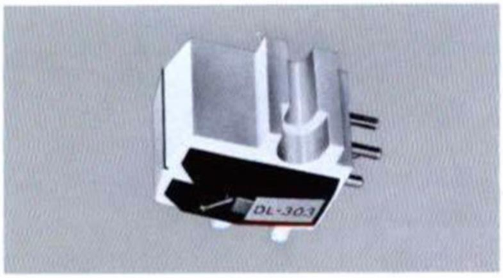
DENON

MC TYPE CARTRIDGE
DL-303
TONE ARM
DA-401

Outstanding tracing ability — Brought by the lightest effective mass of 0.18mg



DL-303 Moving Coil Cartridge

Features:

- Surprising improvement in the tracing ability and excellent disc reproduction realized by precise structure with high compliance and light-weight vibration system.
- Weight: 5.8g . . . flat output response against the stylus force

DL-303. . .ART OF GENIUS

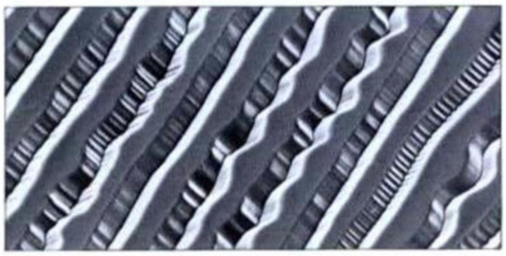
High grade record of the latest recording with its feature of wide range containing great quantity of sharp pulse components has extremely complicated record groove. It is said that when tracing this record groove, unexpectedly large force is applied to the groove wall when it comes to the percussion or other impulsive sound, due to the effective mass at the tip of stylus. The most fundamental point in disc reproduction is to allow the most truthful and accurate tracing as well as protecting the complicated record groove from "damage or abrasion"... "Art of genious... DL-303" the model created in pursuit of the reduction of the mechanical impedance opens the door to the new world of marvellous performance of MC cartridge.

UNIMAGINABLY LIGHT EFFECTIVE MASS OF 0.18mg REALIZED

■ DENON's unique sophisticated vibration system displaying sharp tracing ability over wide frequency range

The significant point to improve the reproduction ability of a cartridge is to reduce the mechanical impedance that is to make it high compliance, and to reduce the effective mass at the stylus point.

With a heavy vibration system, the stylus can not smoothly move specially against delicate record groove in the high frequency range, so that the groove wall is deformatively traced. This results in the distortion of the reproduced sound. Of course such deformation can be brought back by the



elasticity of the record disc, however, if such deformation is extreme, the permanent deformation or the skipping of the stylus may be caused. The big aim in the creation of the DL-303 was to thoroughly reduce the weight of the vibration system and the minimization of the mechanical impedance in the high frequency range.

Flat frequency response is attained up to the range of 70kHz while improving the cross-talk. For this purpose, the DL-303 has the structure as shown below.

- Stylus tip = Special elliptical solid diamond tip having a 0.1 × 0.05mm rectangular section is employed. The weight is less than 0.01mg.
- Cantilever = Double construction with special aluminium pipe tapered at the stylus end portion. As well as being light weight, the rigidity is improved by the high level electrolytic treatment.
- Mass balance of the whole vibration system is attained by winding the generating coil around the light-weight bobbin, and the deterioration of the characteristics due to the partial resonance is eliminated.

■ The high efficiency magnetic circuit and the generating system having precise structure.

Samarium cobalt type magnet that provides a very high magnetic field is employed.

In addition to the improvement made in the yoke structure, this model employs the cross-shaped armature with quality proven in the DL-103 series.

This cross-shaped armature is advantageous in dynamic balance as the coil can be maintained in the center of the magnetic field at all times with the one-point-support system employed, so that the distortion in the generating system can be prevented. Furthermore, it has another merit of equalizing the various characteristics of the right and left channels. With the above improvements, the DL-303 has successfully improved the linearity range and the dynamic range, bringing the magnificent sound expressed in a dynamic scale as a result.

PRIORITY ON THE STABILITY AND RELIABILITY

■ Reduced weight of the cartridge

5.8g. Reduction in the tare of the cartridge is effective to actually reduce the effective mass of the tonearm viewed from the stylus.

Also it results in the stable tracing ability against the warping of the record disc. Yes, we have taken a long stride toward our ideal.

■ Priority on the output voltage against the stylus force change. Stable and high quality performance at all time.

The position of the record groove or the stylus force is always fluctuating because of the warpage of the record disc. etc., therefore, the vibration system of the cartridge is forced to trace while fluctuating its center position.

As shown — in Fig. 5, the DL-303 shows extrem wide linearity under such condition.

Thanks to this, the DL-303 is able to attain stable reproduction sound quality by minimizing the effect on the frequency response or the output voltage, as well as preventing the intermodulation distortion.

Fig.-1 DL-303 Outside view of vibration system

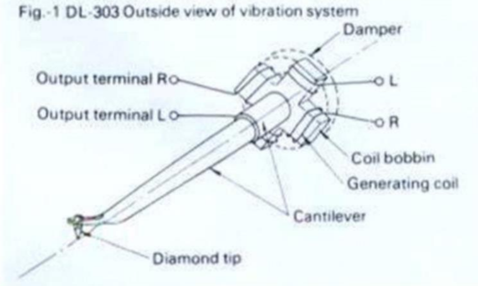


Fig.-2 DL-303 Mechanical impedance characteristics

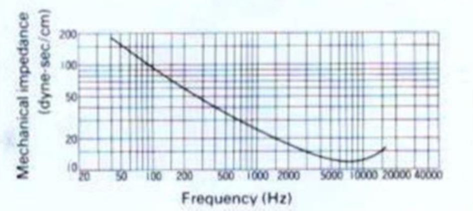


Fig.-3 Frequency response (Output voltage and crosstalk)

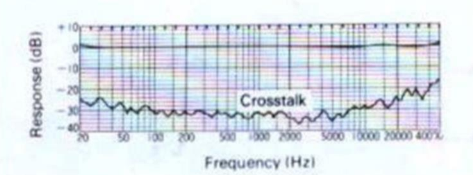


Fig.-4 Structure of DL-303

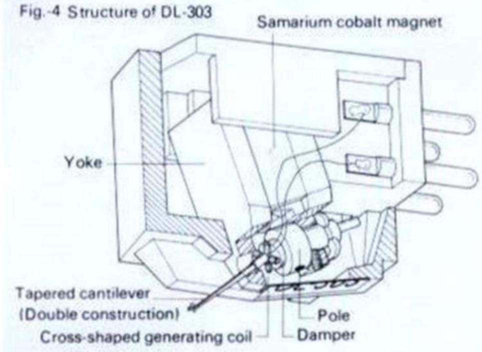
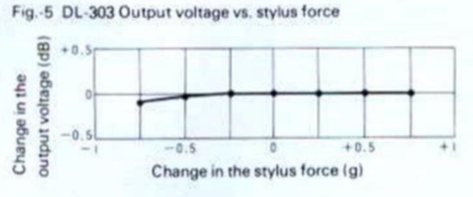


Fig.-5 DL-303 Output voltage vs. stylus force



Best tonearm is just like the air— You'd hardly notice it's there.

DA-401 Light Weight Tonearm (Universal Type)

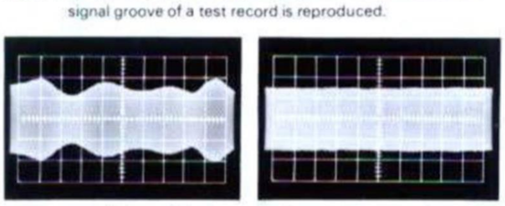
Features:

- Effective mass of the tonearm reduced to improve applicability to every kind of cartridge, and to prevent intermodulationdistortion. Partial resonance or external vibration reduced by the dynamic damping mechanism to attain the original performance of the cartridge.

DA-401 ... INFINITE PURSUIT FOR THE PERFECT REPRODUCTION

Low frequency limit for the cutting on the disc is approximately 20Hz, therefore, the signal at lower frequencies than that is not supposed to come out. However, subsonic noise under 4-5Hz tends to be reproduced larger due to the warpage of the record disc. Fig. 1 (a) and (b) shows the reproduction in the cases where the same high compliance cartridge is mounted on the two types of tonearms with high effective mass and low effective mass.

Photo-1 Output amplitude of the cartridge when 1 kHz stand-still signal groove of a test record is reproduced.



(a) Output with the amplitude modulation (b) Desirable output with minimum modulation

The tonearm having high mass is less compliant to the warpage of the record disc so that the larger change in the stylus force can be observed.
This, of course, is not desirable as far as the cartridge is concerned.
Particulary, when using the cartridge which shows large fluctuation in the output voltage depending on the stylus force, as shown in the curves (a) and (b) in Fig. 2, it will result in the amplitude modulation in the output as shown in Photo (1)-(a).

For the audio instruments which originally deal with the audible range signal, signal close to DC is not a close friend.
Such evil effect as modulation distortion is caused on the signal in the audible range due to the undesirable low frequency range signal being sent to the amplifier or the speaker. The structure where the tonearm truthfully moves against the movement of less than 10 or so Hz to forbid the cartridge to provide output, that is, of course attained by minimizing the effective mass of the tonearm.
Yes, tonearm like the air is what we want, if possible at all.

TOWARDS HIGH COMPLIANCE CARTRIDGE

■ Light weight tonearm reproducing the clear sound

Effective mass of the tonearm including the weight of the cartridge, the compliance of the vibration system of the cartridge and the cut-off frequency (fL) in the low frequency range are inter-related. If this (fL) is too low, tonearm can not perfectly follow the movement due to the warpage of the record disc, etc., and result in the vibration of the stylus instead. The desirable setting value of (fL) is approximately 10Hz (Fig. 3)
Cartridges available on the market tend to show too low (fL) when combined with ordinary tonearm. And it will particulary be difficult to attain the original performance of the high compliance cartridge sufficiently. (Fig. 4) In addition to the highly precise mechanism, the DA-401 is equipped with the lightest possible pipe arm and head shell (this requires special exclusive shell) to reduce the effective mass to prevent (fL) from becoming too low. The arm pipe is a solidified hard light alloy pipe, and hard resin for the head shell.

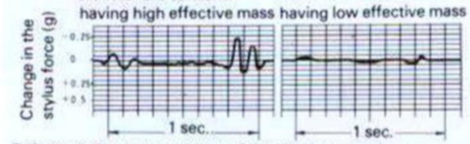
INFINITE PURSUIT FOR THE NON-RESONANCE

■ Still more effective dynamic damping mechanism employed for this light weight arm.

As it progresses towards the lighter weight, one side view would reveal the fact that the mechanical strength in various parts is decreased, and result in causing the partial resonance, and deteriorates the sound quality in the mid range. The dynamic damping mechanism employed for

Fig.-1 Example of the change in the stylus force for the difference of the tonearm

(a) With the tonearm having high effective mass (b) With the tonearm having low effective mass



Reference: Static compliance of the cartridge used: 26 × 10⁻⁶ cm/dyne. The warpage of the record used for the test was just visible to naked eye.

Fig.-2 Example of output vs. stylus force change

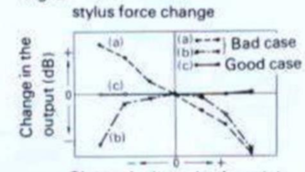


Fig.-3 Example of resonance at lower frequencies

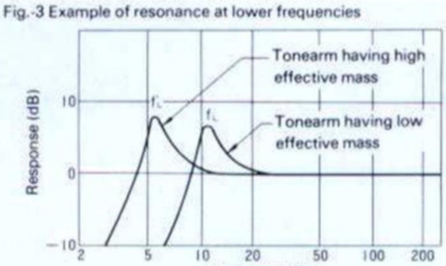


Fig.-4 Distribution of effective mass in tonearms of various companies

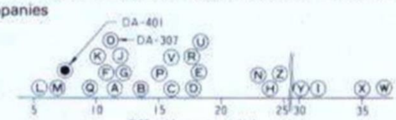


Fig.-5 Output of the cartridge when arm base is vibrated.

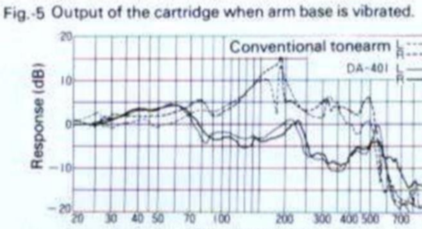
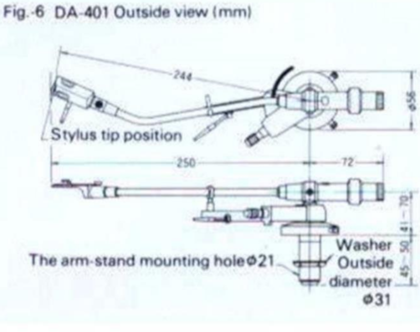


Fig.-6 DA-401 Outside view (mm)



the DA-401 is a structure having damper rubber of adequate viscocity between the tonearm body and the pipe. This dynamic damping action is the key to the problem of the vibration that could not be solved in the past. Now the problem effectively solved, the vibration transmitted from the arm base is effectively reduced, and the result is the radical reduction in the partial resonance in the parts composing the tonearm (Fig. 5).

DL-303 Specifications

Type:	Moving coil
Output voltage:	0.2mV (1kHz, 5cm/s)
Frequency response:	20Hz – 70kHz
Output impedance:	40Ω (20Hz – 20kHz)
Load impedance:	More than 100Ω (Step-up transformer 40Ω)
Channel separation:	More than 28dB (1kHz)
Channel balance:	1dB or less (1kHz)
Static compliance:	35×10^{-6} cm/dyne
Dynamic compliance:	13×10^{-6} cm/dyne
Stylus tip:	Special elliptical solid diamond tip having a 0.1 × 0.05mm rectangular section
Stylus force:	1.2 ± 0.2g
Weight:	5.8g

DA-401 Specifications

Type:	S-shaped, static balance type with dynamically damped system
Overall length:	322mm
Effective length:	244mm
Effective mass:	7.5g
Offset angle:	20.5°
Overhang:	14mm
Tracking error:	2.5° (Max.)
Stylus force range:	0 – 2g (with graduations in increments of 0.1g)
Head shell (exclusive type):	High rigid shell, 2 pcs.
Height adjustment range:	42 – 70mm
Acceptable thickness of mounting board:	5 – 30mm
Output cord:	Low-capacitance cord approx. 1.2m with a 5P connector and pin-plug (40pF/m)
Cueing device:	Oil-damping type
Anti-skating device:	Non-contact magnetic control type (with release mechanism)
Cartridge accommodated weight:	4 – 10g
stylus force:	2g or less

AU-340 AUDIO STEP-UP TRANSFORMER

AU-340 Specifications

Step-up ratio:	1:10 (40Ω), 1:33 (3Ω)
Primary impedance:	3Ω, 40Ω
Secondary impedance:	4kΩ
Frequency response:	10Hz – 120kHz ($^{+0.5}_{-1.0}$dB)
Distortion:	0.05% (20Hz – 20kHz, 40Ω)
Channel balance:	0.5dB or less
Dimensions:	155(W) × 70(H) × 215(D)mm
Weight:	2.1kg
Output cord:	Length: 1m, Electrostatic capacity: 55 pF/m, Core resistance: 0.055Ω/m

Main Features

- Priority given to characteristics . . . 3-step switching of 3Ω, 40Ω and pass.
- High-performance super permalloy core is employed.
- Right and left transformers and individually shielded with permalloy in order to totally shut out the external noise.
- Thorough noise-interceptive design with the principle parts such as the P.C. board and switches covered with the silicon steel plate.
- 2-system input convenient for the comparative trial listening.
- Light-action push switch in consideration of the contact resistance employed.
- Gold plated input/output terminals enhancing the contact reliability
- Top-grade low resistance low-capacity gold plated pin plugs attached.

* The above specifications are subject to change for improvement without notice.

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