Accuphase

MOVING COIL | PHONO CARTRIDGE

AC-3

● Tubular Amorphous Boron Cantilever

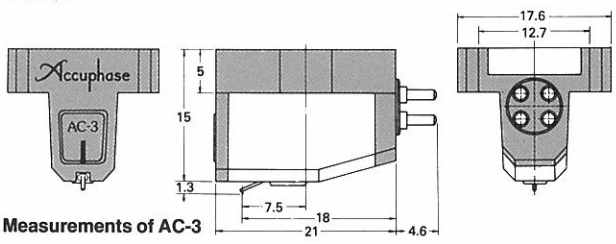
To audio fans, the world of "Analog Audio Recording and Reproduction" is full of thrills and enchantment from sound creation and technical demands yet to be satisfied for the development of active audio equipment with which they can improve sound quality on their own initiative.

In an attempt to satisfy all the requirements of an MC cartridge and with hopes of introducing a new epoch in sound reproduction with long-playing records, Accuphase has developed its latest MC cartridge, the AC-3.

The AC-3 results not only from the know-how we have accumulated through a wealth of experience and research on the highest-quality sounds, but also from the latest in materials science for audio equipment.

Sound reproduction from stable low frequencies to delicate high frequencies with the subtlest nuances of music is now a reality through the integration of such revolutionary materials as a cantilever with dual structure (of tubular amorphous boron and beryllium rod); a newly developed microtrack stylus; a specially processed armature for eddy current elimination; and nonresonant diecast housing.

We are convinced this cartridge will serve as a standard MC cartridge in the audio world for a long time to come.



Measurements of AC-3

Accuphase AC-3

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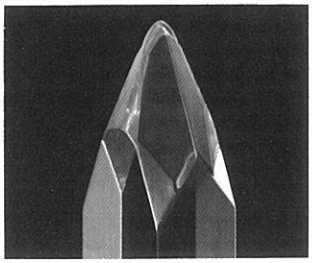
1 HIGH STIFFNESS, LIGHT MASS TUBULAR BORON AND BERYLLIUM ROD CANTILEVER

The most important requirement for a cartridge stylus and cantilever is that they have high stiffness and light mass properties to deliver true replica electrical energy signals by tracing disc grooves in which sound waveform have been recorded. The AC-3 employs an epoch-making cantilever of tubular amorphous boron that was achieved for the first time through an ultraprecision processing technique.

MATERIALS	CRYSTAL STRUCTURE	DENSITY ρ(g/cm^3)	YOUNG'S MODULUS E(10^{11}dyne/cm^2)	STIFFNESS RATIO E/ρ(10^{10}cm^2/sec^2)	SOUND VELOCITY $C=\sqrt{\frac{E}{\rho}}$ (m/sec)
BORON	AMORPHOUS	2.34	42	179	13,400
SAPPHIRE	SINGLE CRYSTAL	4.00	50	125	11,200
ALUMINUM	POLY-CRYSTAL	2.70	7	26	5,100
CARBON FIBER RESIN	—	1.42	16	113	10,600
TITANIUM	POLY-CRYSTAL	4.54	11	24	4,900
BERYLLIUM	POLY-CRYSTAL	1.84	30	163	12,800

This table shows the physical properties of various materials. It reveals that amorphous boron has the second highest Young's Modulus ratio, after sapphire, with relatively low density. The column for stiffness ratio shows the index for weight and stiffness of each material; the stiffness ratio index of boron is by far the highest, confirming that it is the material best suited for a cantilever. Moreover, as boron is made into an amorphous property, stable physical characteristics are realized—important properties that vibration transmission materials should possess.

The AC-3 is designed to provide both improved stiffness and excellent dispersion of resonance. This table also shows that beryllium has a high stiffness ratio with low density. When a beryllium rod is inserted into the tubular boron of the AC-3, its stiffness is successfully enhanced without increasing the equivalent mass.



2 NEWLY DEVELOPED MICROTRACK STYLUS GREATLY IMPROVES CHARACTERISTICS AT HIGH FREQUENCY

The sharper the contact edge of the stylus against the side walls of sound grooves, the higher the quality of sounds that can be reproduced. In other words, the ideal stylus tip contacting the sound grooves has the shape of a knife tip. So far, various styli of different shapes, such as conical, elliptical, and line contact, have been designed with the aim to develop one whose shape is closest to the shape of a cutting stylus.

As a result of our efforts to design a stylus with a shape much sharper than that of a line contact stylus and as a triumph of Accuphase ultraprecision processing technique, we have successfully developed a microtrack stylus with a tip curvature radius of 2 μm, much sharper than an ordinary line contact stylus tip of 6 μm. Further, this new stylus theoretically can reproduce signals of 100 kHz.

The microtrack stylus enhances the fidelity of sound reproduction at high audio frequencies and significantly improves sound quality of the innermost grooves of long-playing records, thereby assuring their reproduction with highly refined sound.

3 SOUND PRESENCE REPRODUCIBILITY IS GREATLY IMPROVED BY DEVELOPING EDDY CURRENT ELIMINATING ARMATURE

The metallic armature of the AC-3 serves as a generating coil and is set in a strong magnetic field. Therefore, eddy current is always generated in the armature in accordance with the direction in which the armature vibrates. This current unfavorably affects the signal current generating in the coil and results in its distortion. This distortion causes an imbalance between right and left qualities and a deterioration of sound focus and transient response.

The AC-3, by covering the surface of the gold-plated armature instantaneously eliminates any eddy current, and high-quality refined sounds can be obtained (patent pending).

High quality permalloy, the most stable magnetic substance, is used for the armature. Specially ordered oxygen-free copper wire of unusual thickness (0.035Ø) for a coil is used to obtain an output of 0.2 mV (5 cm/sec, 1 kHz), with impedance at a low 4 ohms.

4 POWERFUL RARE-EARTH SAMARIUM COBALT MAGNET ASSURES PERFECT LINEARITY

Rare-earth samarium cobalt, one of the most powerful magnets available with low magnetic reluctance, is used in the AC-3. This prevents the magnetic field from being unfavorably affected, and perfect linearity of the armature's hysteresis curve characteristic over the armature entire operating area was achieved by setting the magnetic field strength at 65% of the magnetic saturation point.

5 DIECAST ALUMINUM ALLOY HARD HOUSING

The moving elements of a cartridge receive strong vibrations from record grooves, and the cartridge housing in which these moving elements are incorporated must absorb these vibrations and allow no resonance to occur in response to them. Careful attention was paid to this point in developing the AC-3, which uses a diecast aluminum alloy housing body that has sufficient hardness and high internal loss characteristics to prevent this resonance. Also, the surfaces of the moving elements are flat and may therefore be mounted to the shell smoothly and securely.

AC-3 GUARANTY SPECIFICATIONS

PERFORMANCE GUARANTY:
All Accuphase product specifications are guaranteed as stated.

GENERATING ELEMENT	Moving coil
OUTPUT VOLTAGE at 1 kHz, 5 cm/sec	0.2 mV
FREQUENCY RESPONSE	20 Hz to 60 kHz 20 Hz to 20 kHz±1dB
CHANNEL SEPARATION at 1 kHz	30 dB
CHANNEL BALANCE at 1 kHz	0.5 dB
DYNAMIC COMPLIANCE: Horizontal	18×10^{-6}cm/dyne
Vertical	18×10^{-6}cm/dyne
INTERNAL IMPEDANCE	4 ohms
RECOMMENDED LOAD IMPEDANCE	higher than 30 ohms for head amplifier higher than 3 ohms for step-up transformer
VERTICAL TRACKING ANGLE	20° (IEC/DIN standard)
TYPE OF STYLUS	Microtrack diamond
STYLUS TIP RADIUS	2 μm×70 μm
TRACKING FORCE RANGE	1.5 to 2.0 grams
RECOMMENDED TRACKING FORCE	1.7 grams
WEIGHT, net weight	7.5 grams

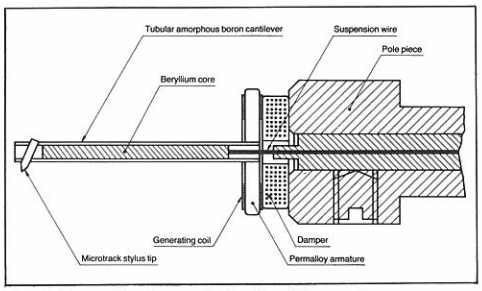


Fig. 1 Cross Section of Moving Element

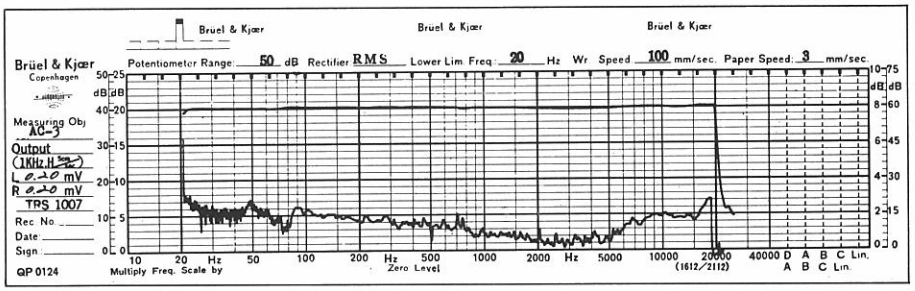


Fig. 2 Frequency Response & Crosstalk

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ACCUPHASE LABORATORY INC.

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