

SANSUI SR929

QUARTZ-SERVO DIRECT-DRIVE TURNTABLE



*© beim Hersteller
Archiv Michael-Otto*

Sansui is proud to contribute to the advancement of state-of-the-art turntable technology with the introduction of the remarkable SR-929. Its newly-developed direct-drive quartz servosystem represents a significant Sansui engineering breakthrough in keeping with our policy as a high-fidelity-only manufacturer to bring you the very finest in musical reproduction.

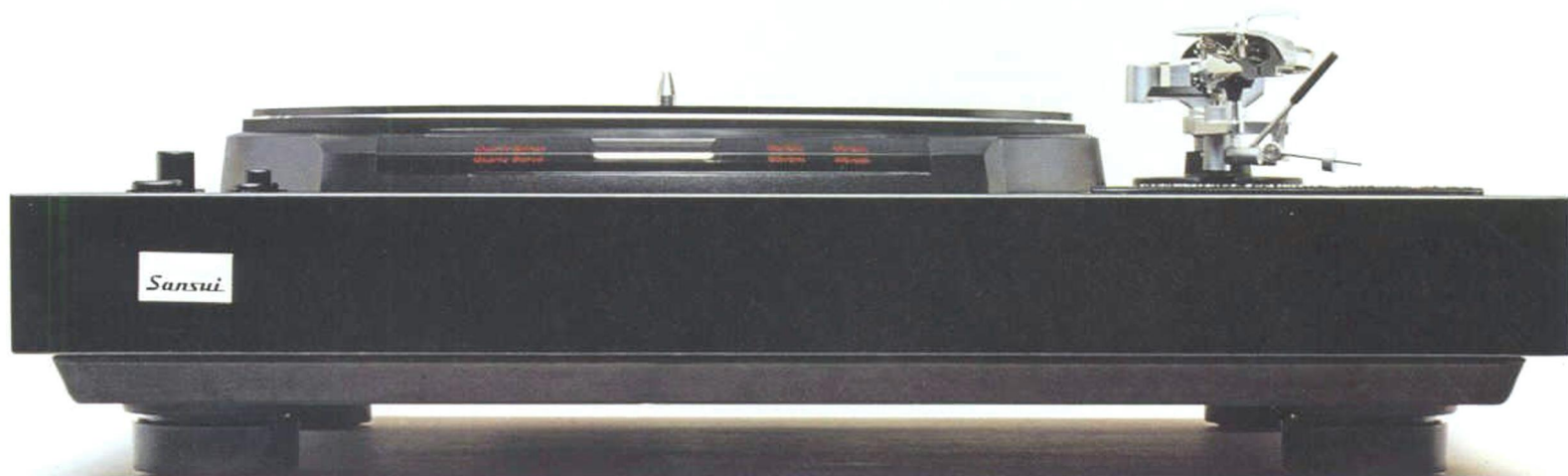
At last, within reach of ordinary music

fans and audio buffs, there is now a turntable so accurate and so precise that it exceeds even the strictest professional standards of performance. Not only is its speed very close to absolutely perfect, its generated noise in relation to the audio signal is, in practice, immeasurable. Platter rotation constancy is amazing, with a deviation of less than 0.002%. That's less than 2 revolutions out of 100,000! And speed is unaffected by load

changes, temperature changes, power voltage/frequency fluctuations and aging.

Learn how Sansui combines the latest quartz crystal accuracy with advanced electronic servo-circuits to achieve this in the SR-929. Not only is every one of the basic performance criteria met impeccably but as a total balanced system, the SR-929 is the ultimate in direct-drive turntable perfection. From Sansui, where it's all hi-fi.

Sansui



Sansui combines quartz crystal and PLL servo system—the ultimate in direct-drive turntable performance.

SANSUI QUARTZ DIRECT-DRIVE SERVOSYSTEM

Precision Personified

An energized quartz crystal, like that in a fine quartz timepiece, forms the heart of the Sansui SR-929. It is precision personified, generating a constant and accurate frequency signal against which the actual speed of the direct-drive motor is continuously compared, via a Phase-Locked Loop (PLL) circuit, and adjusted accordingly. Use of the PLL as the speed control assures far higher accuracy than conventional servosystems can offer.

The reason is that *phase*, not voltage or power-supply frequency, is the main reference comparison factor. The PLL circuit itself is the cream of today's advanced technology, using six C-MOS ICs (Complementary Metal-Oxide-Semiconductor Integrated Circuits) for stable, reliable control.

The PLL compares the phase difference of the reference pulse signal, accurately generated by the crystal, and the speed-proportional pulse, generated by the

Frequency Generator (FG) mounted on the rotating shaft of the motor. Any difference is converted into voltages, which in turn are compared with the reference voltage to drive the servo-system. With the PLL and FG servo-systems coupled, the SR-929 thus delivers exceptionally improved drift and load characteristics.

Unrivalled Drift Characteristics

The crystal oscillator generates a stable frequency regardless of changes in temperature. Thus when temperatures go up, as caused by climatic changes or thermal build up in electronics components, the SR-929's direct-drive motor remains cool and constant with never a speed deviation.

The Pitch Never Falters

Tchaikovsky's "Concerto in D for Violin and Orchestra" or Miles Davis' "Sketches of Spain" or Pink Floyd's "Wish You Were Here." Can you imagine how important correct musical pitch is to these and other great works of recorded music? When a recording contains alternate passages of soft, subtle music and strong pulsive dynamics, correct platter speed is

of critical importance. When your stylus enters, say, a percussive piano passage it is forced to move with massive acceleration. When this occurs, the SR-929 instantly detects and compensates for the slowdown, however minor it may be. You never notice a faltering of pitch, for the platter speeds up just enough to prevent it.

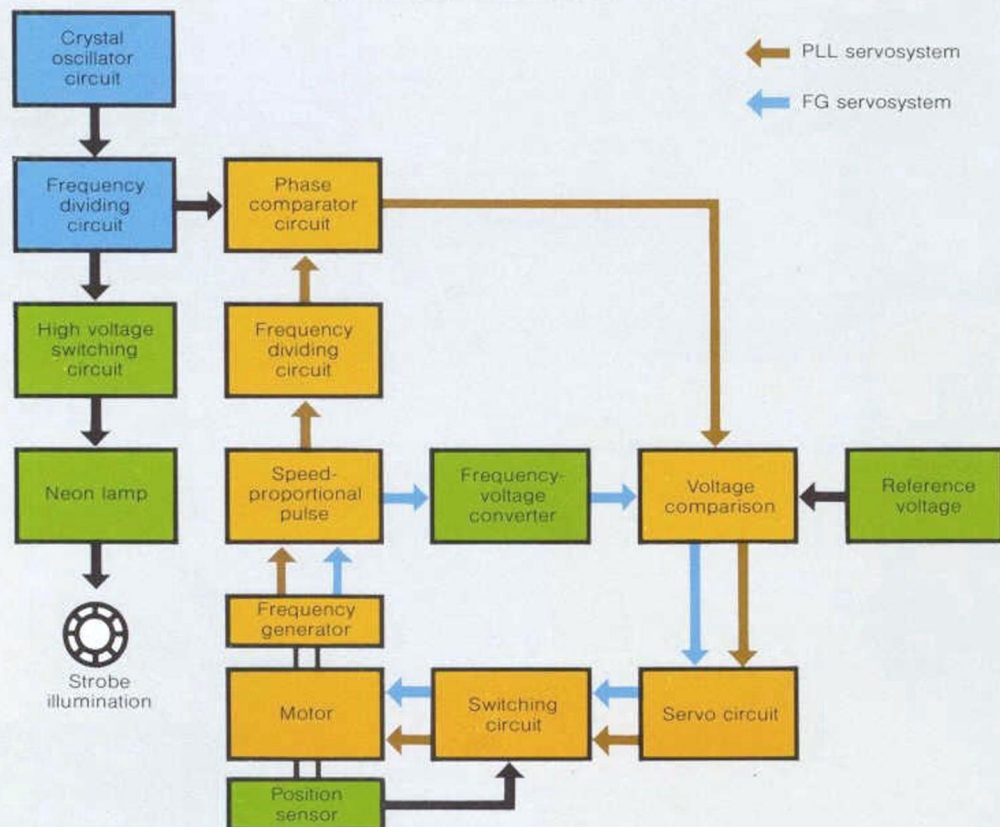
As the graphs on page 6 show, tracking force can be increased to three, six or even as much as 10 grams at such dynamic passages. Still the platter maintains perfect speed. Indeed, it NEVER slows (under reasonable conditions)—the deviation is 0% against almost any load change. And since the quartz servo-system is impervious to external influences, this perfection is always yours for good listening.

Non-Sinusoidal Stroboscope

Conventional strobes are keyed to the power frequency, which is subject to rather heavy fluctuation. Platter-edge strobe patterns thus often appear blurred even at correct speed. The strobe in the SR-929 is keyed to the quartz-generated constant frequency signal, as you can see in the block diagram.

Unlike conventional strobes, the strobe light in the SR-929 remains clear and cool because it uses pulsive waves, and because its rotational mechanism is micron-finished. The ratio of pulse to platter speed is such that only one row of platter-edge markings is needed on the SR-929—they work for both speeds (33½ and 45 rpm) at any power voltage/frequency. The beauty of the system is enhanced further by the concealed location of the lamp itself. You may "unlock" the Quartz Servosystem in the SR-929 and adjust the platter speed within ±3.5% of nominal.

QUARTZ-SERVO BLOCK DIAGRAM



20-Pole 30-Slot DC Servo Direct Drive Motor

The SR-929 motor couples a highly magnetized 20-pole rotor magnet with a 30-slot core. The resulting high drive torque, combined with the high moment of inertia of the heavy platter, assures smooth platter rotation and excellent resistance to load changes.

Platter speed is controlled by the bias-controlled saturable core (Pat. Pend.), a feature characterized by unmatched reliability. Rotational components such as the center spindle and the sintered metallic sleeve are mirror-finished for accuracy.

These features combine to achieve outstanding performance specifications—better than 66dB signal-to-noise ratio (IEC-B), less than 0.028% wow and flutter, and less than 0.002% speed accuracy. One can expect that these impeccable specifications will be maintained over long years of turntable operation.

Another feature is a Frequency Generator mounted on the drive motor, used to lock the phase of the crystal oscillator and to detect motor speed. Utilizing an ultrared-sensitive LED and a photo transistor, the disc rotates and produces frequencies proportional to the motor speed.



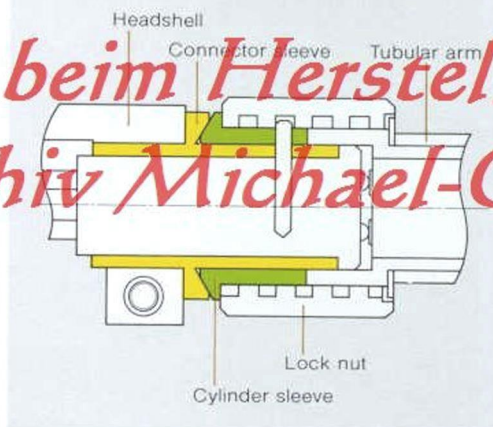
Power Supply

The toroidally wound power transformer in the SR-929 is more efficient and suffers less magnetic leakage flux than conventional cut-core types. It contributes to excellent overall signal-to-noise ratio of better than 66dB (IEC-B).

An End to Tonearm Resonance

Inside Sansui's superb S-shaped tubular tonearm is newly-developed acoustic absorbent (Sansui Pat. Pend.) to damp all resonance however slight before it affects performance. The weight shaft is decoupled from the tonearm by a special rubber assembly. The arm base is die-cast of solid zinc alloy with twice the mass of conventional bases, and mounted firmly to the cabinet. The headshell is a one-piece, die-cast aluminum unit with high density and rattle-free strength. For mechanical strength, the cylinder sleeve on the arm nut has a tapered interface so that it fits snugly with the connector sleeve on the headshell (Pat. Pend.). With these improvements, all possible tonearm/headshell resonance is avoided.

SHELL/LOCKNUT CROSS SECTION



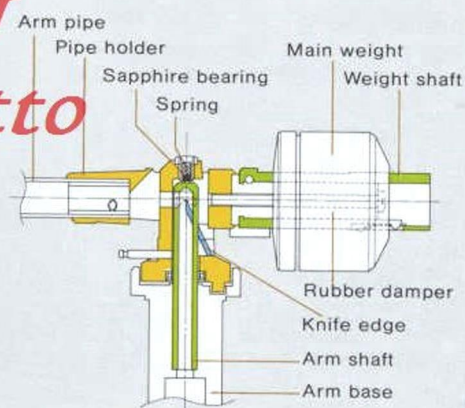
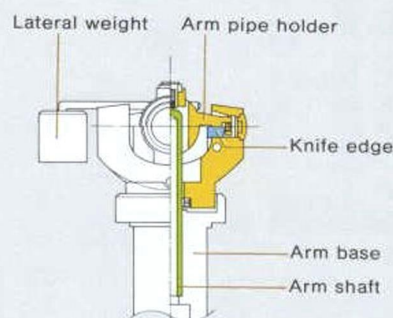
Tonearm Support System

The S-shape of the tonearm is ideal for maintaining tracking accuracy. For



vertical movement Sansui uses our proven knife-edge support. For the horizontal plane a ball-bearing jewel needle-point assembly provides rugged yet sensitive support. Today's cartridges, with their lightweight tracking force requirements, perform at their best on the SR-929.

ARM SUPPORT CROSS SECTION



Other Tonearm Features

Flexibility is the keynote: (1) an arm height adjusting screw permits $\pm 3\text{mm}$ adjustments, (2) a nut screw provides vertical stylus alignment, (3) the anti-skating device is the easy-to-use pivot type, (4) the cartridge pin connectors are gold-plated for best electrical results, (5) the direct-readout tracking force dial has calibrations in steps of 0.05 grams. For still more convenience, the SR-929 includes (1) a unique arm lifter device allowing the stylus to descend and ascend smoothly, (2) a unique lever-system inside force canceller, (3) a lateral balancer, and (4) an arm rest newly designed to snap in the arm with no stress to vital rotational parts.

HANDSOME & HEAVY CABINET/BASE

Lacquerlike Luster in Black

To complement the advanced technological achievements in the SR-929, we've added a contemporary look. Layer after layer of select polyester resin is applied carefully to each particleboard cabinet panel until a piano-like luster glows through. It's a time consuming, costly process—but beautiful. And by the way, it is highly resistant to nicks and scratches and wipes clean with a soft cloth.

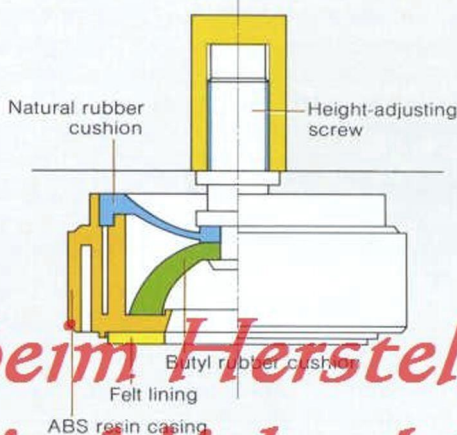
Solid Resin Concrete Base

Hugging the motor assembly to ward off all external and internal vibration is a super-dense inner base formed of a new inorganic material, resin-concrete. The weight and mass of this unique base-core combines with the thick particleboard base to provide ideal internal loss within the cabinet. Further, an aluminum die-cast motor-mounting base tops the assembly for extra rigidity. Each and every detail of construction has been calculated for maximum prevention of acoustic feedback ("howling")—and it works. Reproduction has never been better.

Natural Rubber Insulators

Each of the four height-adjustable insulators (feet) on the SR-929 serves to isolate the whole form from external vibration. They each are made of two layers of cushion, each layer composed of different rubber formulation, housed in resin casings. Maintaining critical levelling at the platter surface is easy.

INSULATOR: CROSS SECTION



Hinged Dust Cover

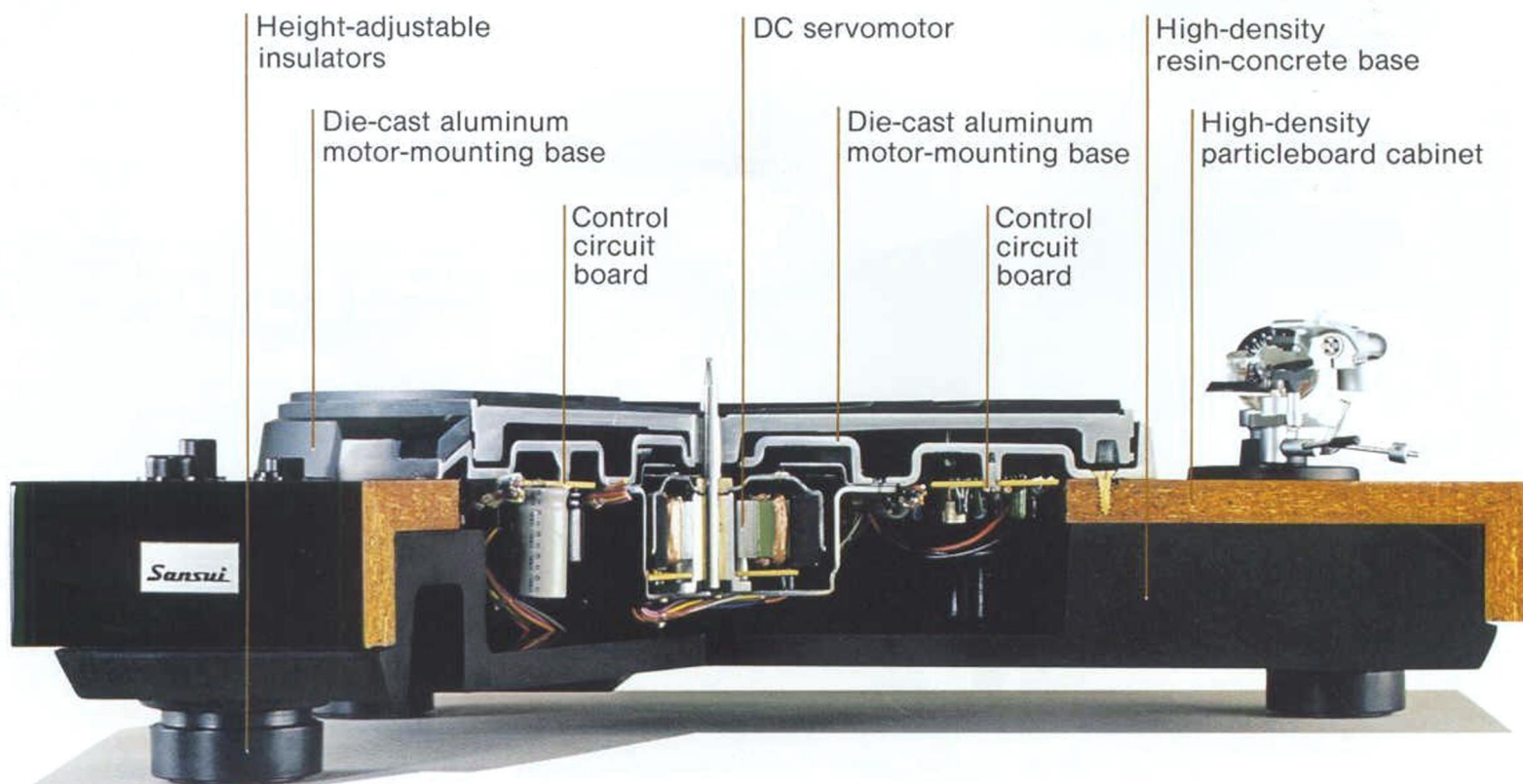
The acrylic dust cover is indeed hinged—the hinges are part of the cover itself, not mounted on the SR-929's base. It's an improvement you'll enjoy.

Other SR-929 Features

- **MAT**—Specially treated rubber platter mat can be used on either side. One side is slightly concave, with pyramidal projections on the periphery to provide ideal record/mat contact for resonance-free record reproduction.
- **CONTROLS**—Sansui's attention to "human engineering" is at work here, too. Power, Speed Selection, Pitch Control, and Quartz-Servo Lock buttons are arrayed on the left side of the motor board, removing the clutter from beneath the tonearm.



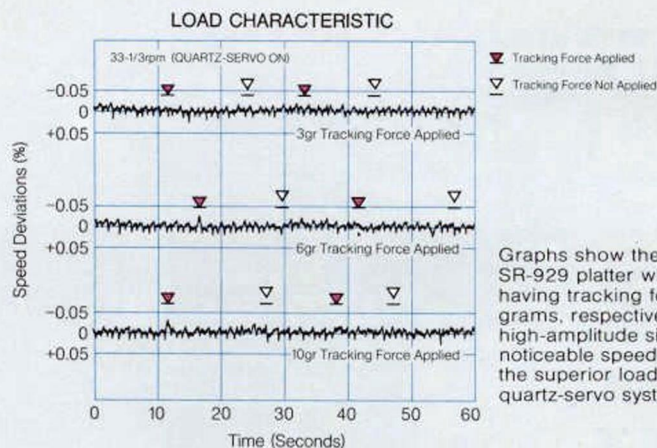
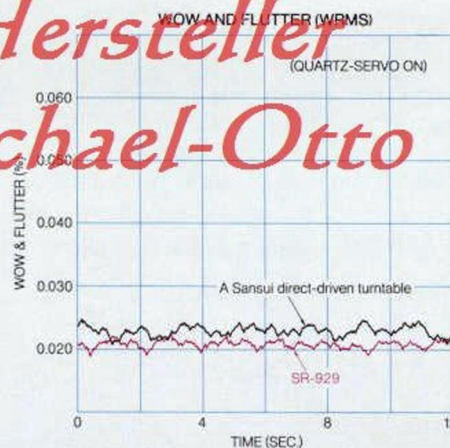
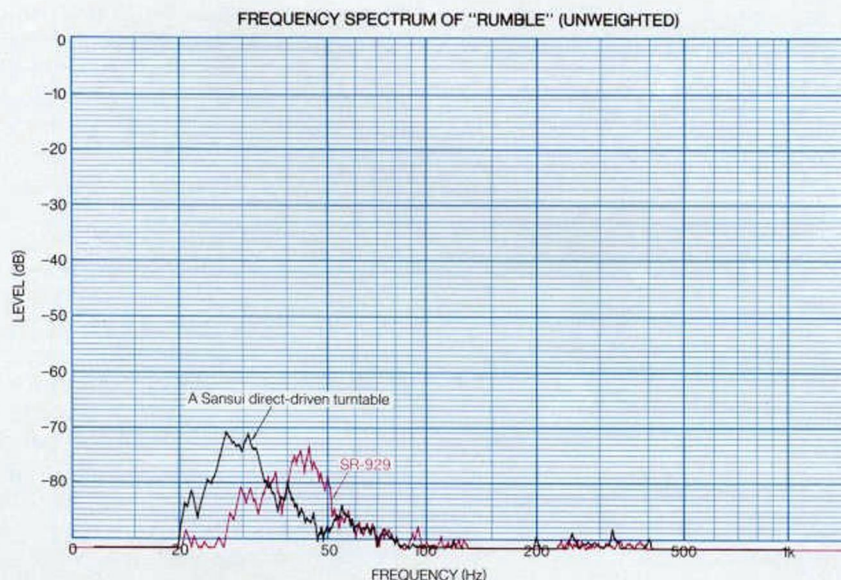
- **CABLES**—Low-capacitance output cables protect the high frequency signals from attenuation.



SPECIFICATIONS

TYPE	Two-speed, quartz-servo direct-drive manual turntable
MOTOR	20-pole, 30-slot DC brushless type with built-in Frequency Generator
DRIVE SYSTEM	Direct spindle drive, quartz-servo controlled
PLATTER	302mm (11 $\frac{1}{16}$ ") aluminium die-cast weighing 1.4kg (3.1lbs.)
PERFORMANCE	
WOW & FLUTTER	less than 0.028% (WRMS)
SIGNAL TO NOISE RATIO	better than 66dB (IEC-B)
RUMBLE	better than -74dB (DIN-B)
BUILD-UP TIME AND ARC ANGLE	within 1.2 sec. (120°)
PLATTER SPEED DEVIATION	less than 0.002% (QUARTZ-SERVO ON)
TEMPERATURE COEFFICIENT	less than 0.00003%/°C (QUARTZ-SERVO ON)
LOAD CHARACTERISTICS	0% (QUARTZ-SERVO ON) 0.1% (QUARTZ-SERVO OFF)
PLATTER SPEEDS	33 $\frac{1}{3}$, 45 rpm
FINE SPEED ADJUSTMENT	±3.5% (QUARTZ-SERVO OFF)
TO NEARM	Statically-balanced S-shaped resonance-free tonearm with height-adjustable jewel needle point & knife-edge support, and with vertical stylus alignment device
LENGTH OVERHANG	240mm (9 $\frac{1}{2}$ ") pivot to stylus tip
MINIMUM TRACKING	15.6mm ($\frac{5}{8}$ ")
FORCE SETTING	0.5g (when using cartridge guaranteed to operate at 0.5g tracking force)
ACCEPTABLE CARTRIDGE WEIGHT	2 to 11g, 11 to 21g (with sub weight)
COMPENSATION CUEING	Bias and lateral balance
CABINETY	Separate lever at arm base Heavy-weight cabinet (a solid-particle board enclosure mounted on a resin-concrete base) with removable, free-stop hinged dust cover and height-adjustable insulators
POWER REQUIREMENTS	100V, 120V, 220V, 240V 50/60Hz U.S.A. and Canada models: 120V, 60Hz only European models: 220V, 60Hz only UK models: 240V, 50Hz only
POWER CONSUMPTION	less than 8 watts (rated)
DIMENSIONS	490mm (19 $\frac{1}{16}$ ") W 173mm (6 $\frac{7}{8}$ ") H 381mm (15") D
WEIGHT	17.1kg (37.7lbs.) Net 19.3kg (42.5lbs.) Packed
ACCESSORIES	45 rpm record spindle adaptor, Low capacitance output signal cable, Overhang gauge, Sub weight, Cartridge mounting gauge

The SR-929 is not provided with a cartridge: it will accept any quality cartridge, light or heavy, you select. Design and specifications subject to change without notice for improvements.



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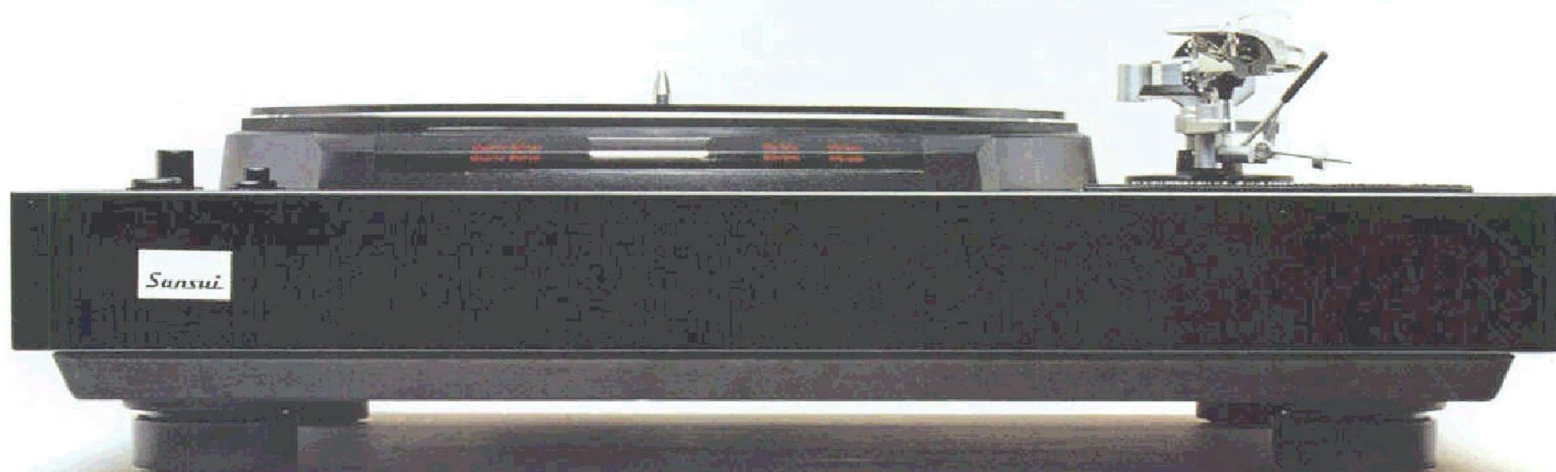
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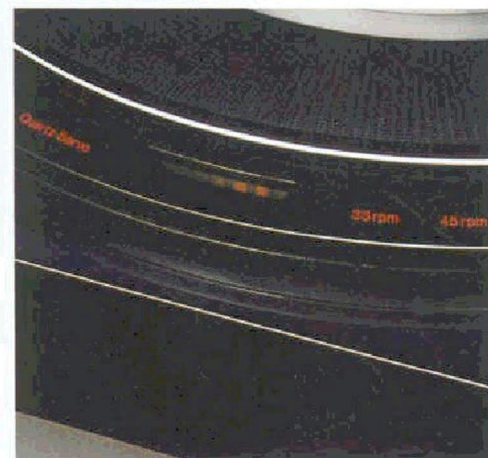
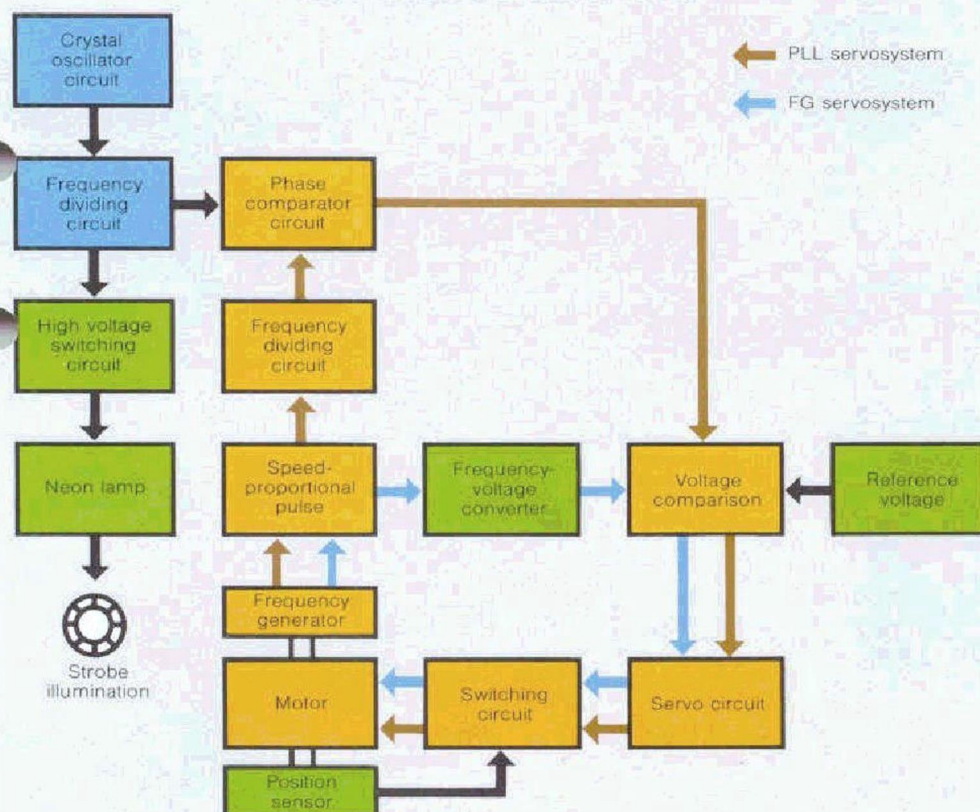
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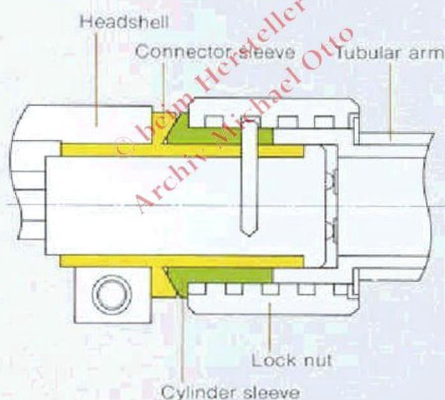
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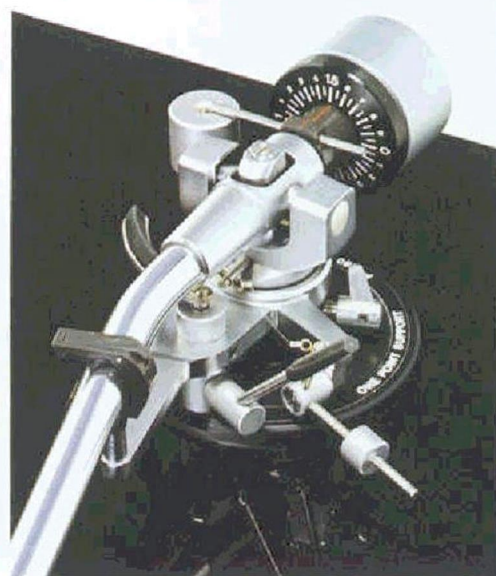
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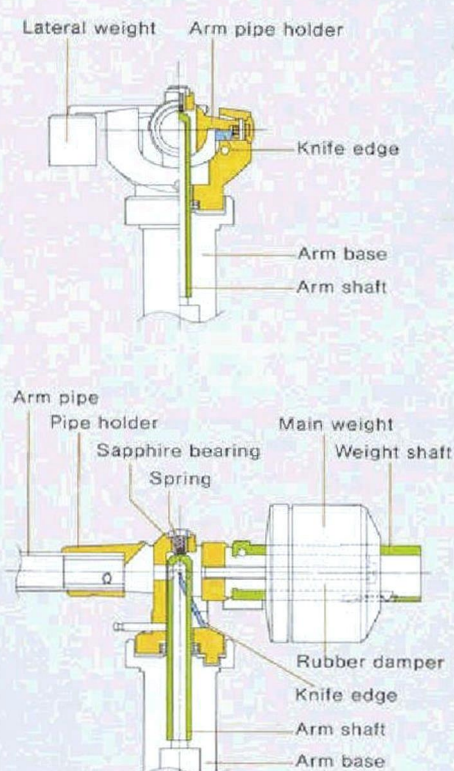
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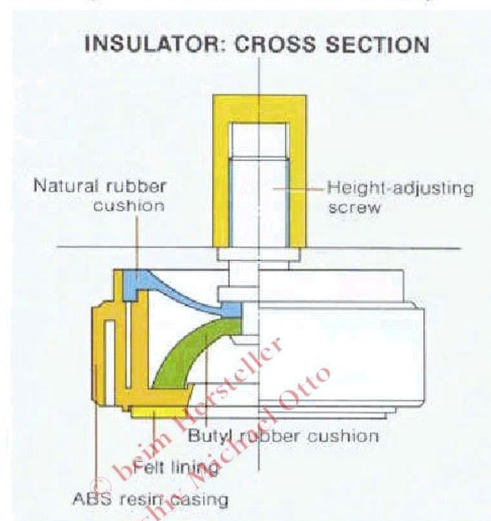
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Hinged Dust Cover

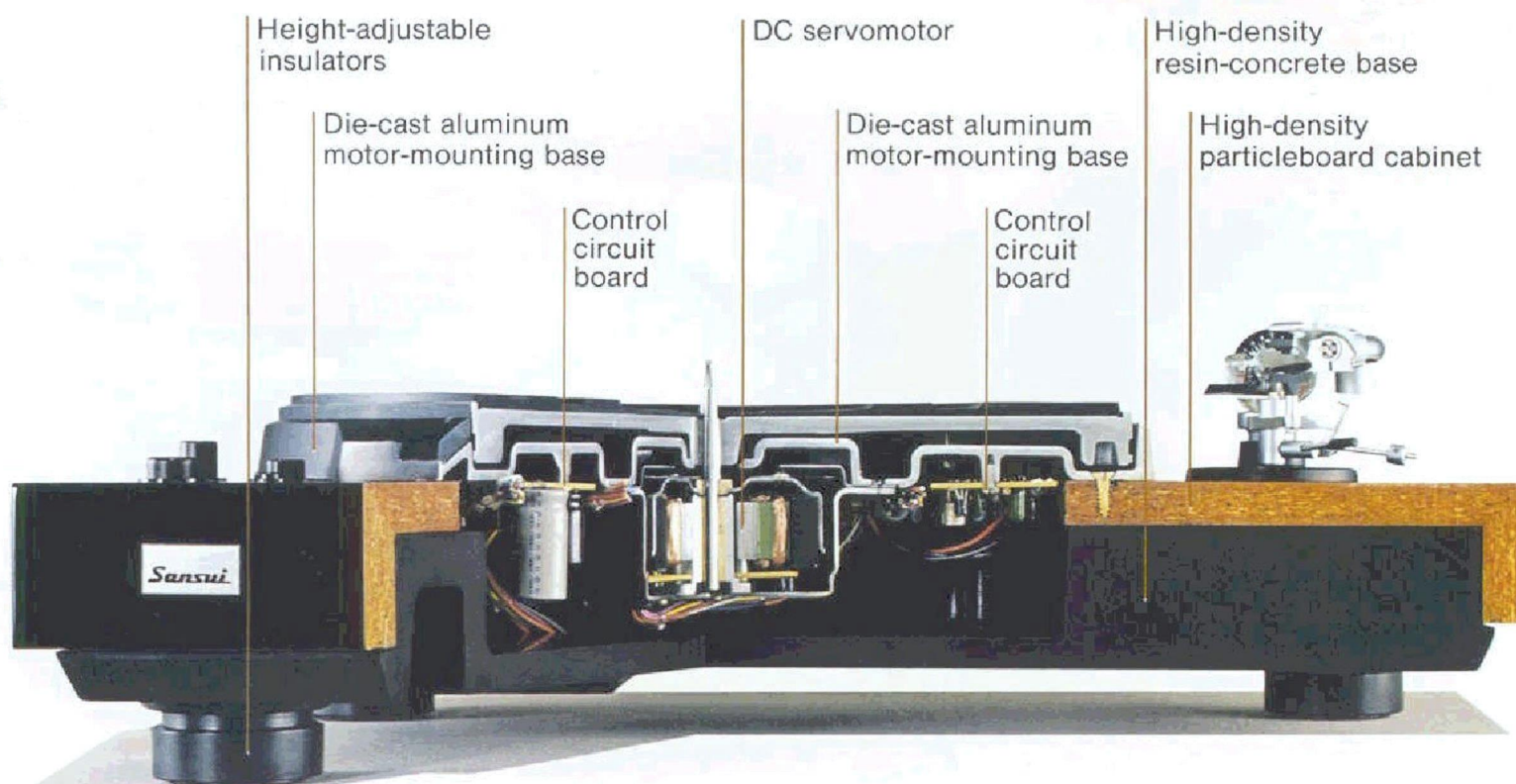
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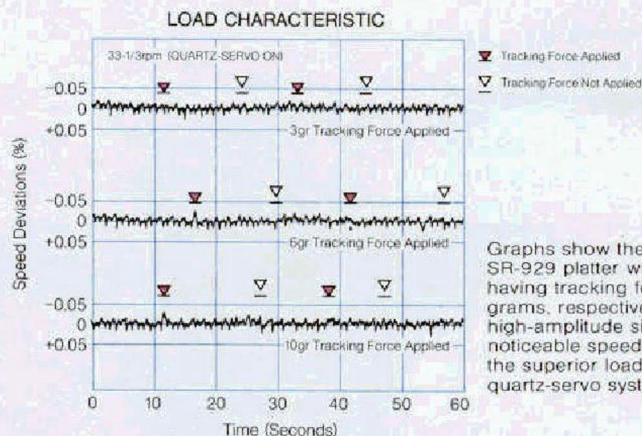
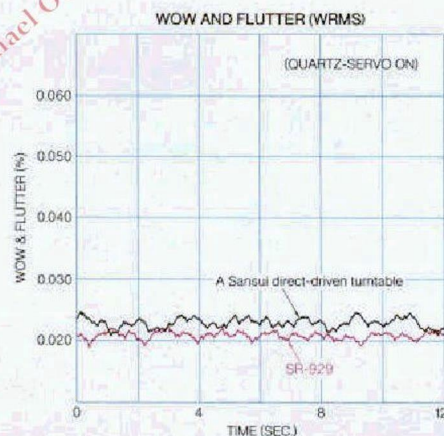
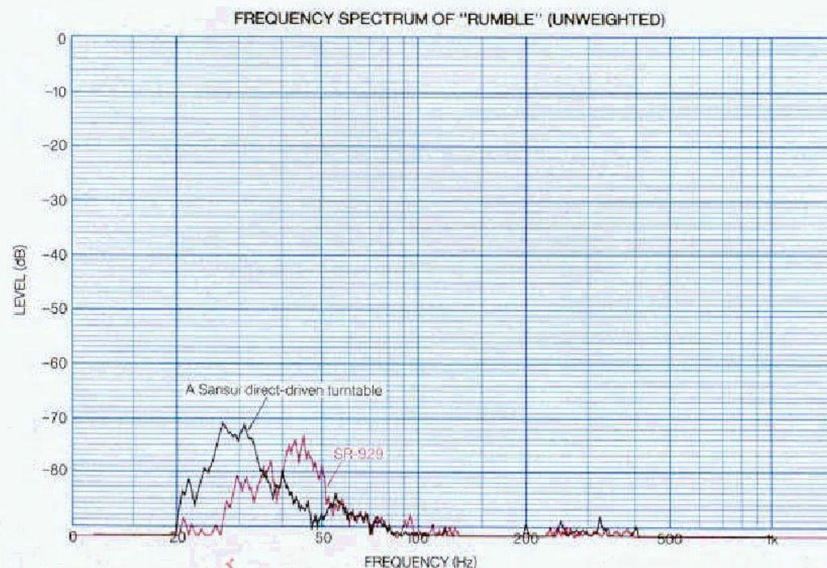
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WOW & FLUTTER	less than 0.028% (WRMS)
SIGNAL TO NOISE RATIO	better than 66dB (IEC-B)
RUMBLE	better than -74dB (DIN-B)
BUILD-UP TIME AND ARC ANGLE	within 1.2 sec. (120°)
PLATTER SPEED DEVIATION	less than 0.002% (QUARTZ-SERVO ON)
TEMPERATURE COEFFICIENT	less than 0.00003%/°C (QUARTZ-SERVO ON)
LOAD CHARACTERISTICS	0% (QUARTZ-SERVO ON) 0.1% (QUARTZ-SERVO OFF)
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FINE SPEED ADJUSTMENT	$\pm 3.5\%$ (QUARTZ-SERVO OFF)
TO NEARM	Statically-balanced S-shaped resonance-free tonearm with height-adjustable jewel needle point & knife-edge support, and with vertical stylus alignment device
LENGTH	240mm (9 $\frac{1}{2}$ ") pivot to stylus tip
OVERHANG	15.6mm ($\frac{5}{8}$ ")
MINIMUM TRACKING	FORCE SETTING 0.5g (when using cartridge guaranteed to operate at 0.5g tracking force)
ACCEPTABLE CARTRIDGE WEIGHT	2 to 11g, 11 to 21g (with sub weight)
COMPENSATION	Bias and lateral balance
CUEING	Separate lever at arm base
CABINETRY	Heavy-weight cabinet (a solid-particle board enclosure mounted on a resin-concrete base) with removable, free-stop hinged dust cover and height- adjustable insulators
POWER REQUIREMENTS	100V, 120V, 220V, 240V 50/60Hz U.S.A. and Canada models: 120V, 60Hz only European models: 220V, 60Hz only UK models: 240V, 50Hz only
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The SR-929 is not provided with a cartridge: it will accept any quality cartridge, light or heavy, you select. Design and specifications subject to change without notice for improvements.



Graphs show the speed deviations of the SR-929 platter when separate tonearms having tracking forces of 3, 6 and 10 grams, respectively, are made to track high-amplitude signals on a record. Lack of noticeable speed deviations demonstrates the superior load characteristic of the quartz-servo system.

が最終過程に入る頃、時を同じくしてトーンアームの設計も形を整えつつあった。

このベースとなったトーンアームは、まぎれもなくSR-525で実績を積んだ、ナイフエッジを特徴とするスタティックバランスタイプ。そしてこのSR-929に搭載予定のS字形パイプをもつ新設計トーンアームは、その回転機構の高性能化に見合った発展型で、随所に携った技術陣の苦心の跡が見受けられる、まさに力作である。

ここに至るまでの過程には、数多くの試作アームが製作されテストされて陽の目も見ずに消えていったのだが、現在ここにお見せできるのはそのごく一部である。

当初アームを開発するにあたり、スタッフから問題提起されたのは、従来のもの以上の感度の要求であり、同時に水平・垂直共に軸受の耐久性を向上させるという、相反する条件であった。そして音質的にも優れているというのは絶対的条件であり、アーム全体の防振にはかなりの努力が払われている。

まずアームの共振を極力抑えるという点で二つの対策が施された。その一つは重量で抑えられるところには重鉛ダイキャストをふんだんに使い、パイプは軽量化を計ると同時に内部にはポリエチレンシートを百足状に切ったものを封入し、共振を吸収させている。

共振の原因となり易いアンチスケイティング・デバイスなども、ブラブラ揺りのような共振し易いものではなく、ガッチリと

したテコ式のものが組み込まれており、音質に悪影響を及ぼすアーム全体の共振点も完全に可聴周波数帯域外に追い出されている。(foは約5Hz)

またこのトーンアームに見られる最大の特徴といえる垂直軸受けのナイフエッジには、SR-525で確信を得た構造のものに、さらに検討を加え完成度を高めた発展型といえるもので、有名な英国SME社のそれとは逆の、垂直軸を支える下側の受けにあたる方がナイフであり、つまり上向き

のナイフの刃にパイプは付けられた。型の軸受けが乗っている形状である。

このナイフエッジ方式を採用するにあたっては、賛否両論があったのであるが、その理由の一つとしてエッジが反共振を起す危険性を指摘するスタッフもいた。その実質的な対策としては、エッジの材質に強靱なSK-3炭素鋼をタフトライト処理して採用し、長期使用の摩耗によるガタの発生を極力抑えると同時に、先端形状にも留意してマイクロオーダーのRを付けるなど、

エッジと受ける側のV溝底部の接触点がより密着度を高めるような配慮がされている。

結果的には、それらの難しい条件を克服した後のナイフエッジ採用の効果は目ざましく、初動感度も10ミリグラム以下と、俊敏な作動状態を示している。

水平方向の回転軸はワンポイントサポートに、宝石軸受と共にスタビライザー用ラジアルベアリングを起用、これも初動感度20ミリグラム以下とこの種の構造の軸受と

SR-929各部断面図

