

Hi-Fi  
Best Reports

NOVEMBER-DECEMBER 1980 \$1.35  
UK 95p

# hi-fi stereo

## BUYERS' GUIDE

### AUDIO ACCESSORIES

Hi-Fi Buff Stuff from \$1 to \$100

### HEADPHONES

Compare 7 Top Sellers

### SPEAKER REVIEWS:

Infinity RSa  
Mantel-Mount-Short Carnival

Library  
75-F PLEASANT ST  
AUBURN ME 04210  
-F40 Q1 129NOV80\*

Decks,  
Decks,  
Decks, and more.



Spotlight on: Mitsubishi's Vertical Turntable  
Philips' Super New Cassette Deck



# DISCWASHER D4 SYSTEM



# A NEW STANDARD OF RECORD CARE

## **NEW D4 FLUID**

Inherently more active against record contamination. Inherently safe for record vinyl. Preferentially absorptive formula carries all contamination off the record.

## **NEW D4 FABRIC**

Unique directional fibers preferentially remove fluid and contamination. D4 fabric results in clearly better cleaning, better drying and ultimately residue-free surfaces.

## **UNMATCHED VALUE**

The Discwasher D4 System is enhanced by the durability and aesthetics of the hand-finished walnut handle. Included in the D4 System are the DC-1 Pad Cleaner and new instructions.

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PRODUCTS TO CARE FOR YOUR MUSIC

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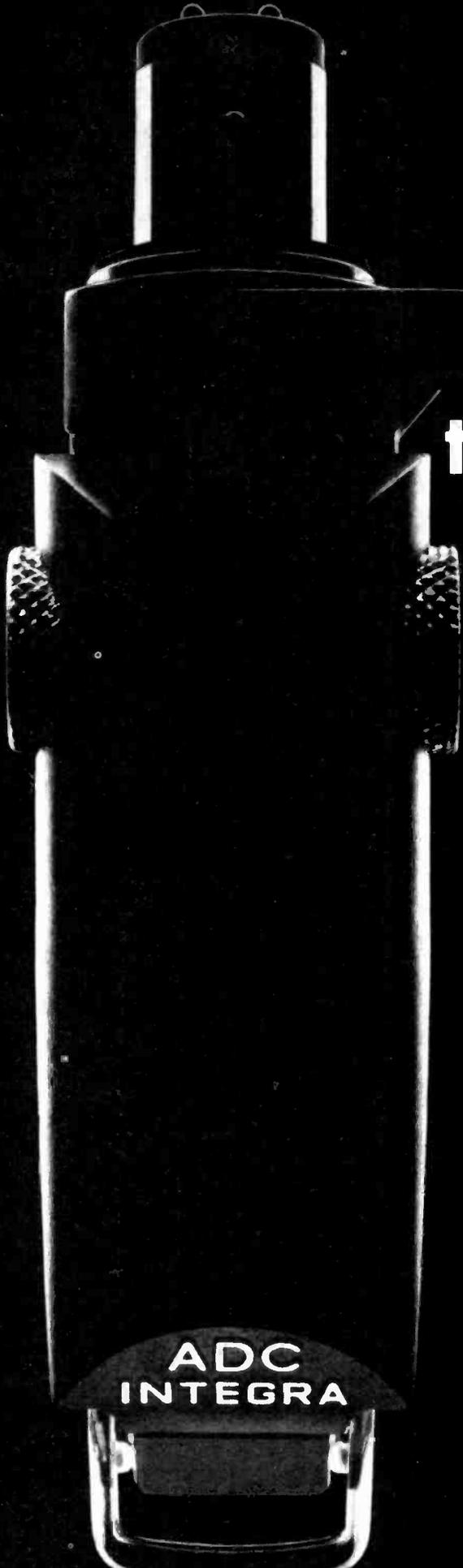
Discwasher, Inc., 1407 N. Providence Rd., Columbia, MO 65201

# The advantages of owning an ADC Integra

# VS

# the disadvantages of owning anything less

Keep count. There are quite a few. First, the Integra is a totally integrated headshell/cartridge. It upgrades your tonearm by lowering its effective mass by as much as 50%! That's a big advantage. No matter what turntable you own. So is Integra's unique vertical tracking angle adjustment. Without it, you're compromising at best. With it, the Integra gives you the optimum match for the vertical tracking angle record companies use to cut their masters. There's also Integra's overhang dimension adjustment. It's simple. To set the optimum offset angle all you do is release the adjustment lock. Adjust. Then re-lock. No more nuts. No more bolts. No more hassles. But there are more Integra advantages. Like Integra's precision molded carbon fibre (versus our competitors molded plastic) body. It not only reduces mass dramatically, it virtually eliminates low frequency signal loss and flexing. But the biggest advantage of all has to be the fact that all those other advantages are available in three different ADC Integra models. One for every kind of budget. All for one kind of sound... devastating. If you'd like to hear more, call Audio Dynamics Corp. toll-free (800) 243-9544 or your ADC dealer.



ADC  
INTEGRA

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ADC INTEGRA

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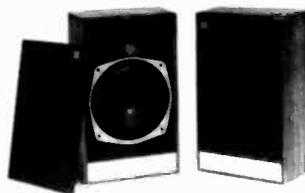


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# hi-fi/stereo

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Stereophones \$149.95.

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It's all too rare when you can fully immerse yourself in music. There are so many distractions... even at home. Household noises, traffic, and perhaps acoustics or loudspeakers which limit enjoyment.

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## audio-technica.

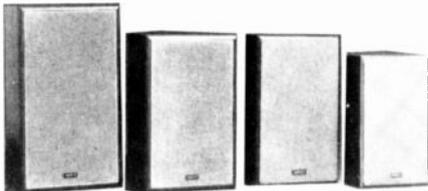
AUDIO-TECHNICA PROFESSIONAL AND HOME PRODUCTS FOR BETTER SOUND



# THE LATEST HI-FI COMPONENTS IN OUR... AUDIO SHOWCASE

## New Loudspeaker Series

Advent offers four new acoustic suspension loudspeakers that are said to provide unusually high performance per invested dollar. The top-of-the-line Model 5002 (\$199.95 each) utilizes the classic Advent woofer and a new "Direct Report" tweeter which is claimed to be exceptionally smooth, with low distortion and wide dispersion. The claimed outstanding performance is attributed to "careful coordination of



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relevant geometric factors." The system has a two-position crossover switch for adjusting the sound for "concentrated listening" or for conversational "background" music. Specs for the 5002: frequency response, 42 to 23,000 Hz  $\pm 2\frac{1}{2}$  dB; impedance, 8 ohms nominal, 6 ohms minimum; harmonic distortion, less than 1 percent over 50 Hz at 1 watt and over 100 Hz at 10 watts (3 percent at 100 Hz at 10 watts); crossover, 1.8 kHz; sensitivity, 87 dB at 1 watt (1 meter on axis). Model 4002 (\$169.95) uses the same drivers in a smaller cabinet with a pre-set crossover. These changes make possible a lower price by trading off lowest bass. Model 3002 (\$129.95) includes the "Direct Report" tweeter and high performance woofer designed for smaller cabinets. And model 2002 (\$99.95) is the least expensive speaker in the series; its tonal balance, frequency response, and dispersion are claimed to be typical of systems costing hundreds of dollars more.

## High-Speed Power Amplifier

Nikko Audio's Alpha 220 is a 120-watts-per-channel power amplifier having a DC servo-feedback loop, non-switching output circuitry, and a high slew rate. The unit's input circuit uses dual field effect transistors (FETs) for

lowest noise and distortion; the remaining stages employ wideband bipolar transistors. The amplifier has a slew rate of 100 volts per microsecond and a rise time of one microsecond. Low frequency signals are monitored and corrected by a DC servo-feedback loop.



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The output stage is operated in a continuous nonswitching mode, using circuitry that tracks transistor bias in synchronization with the music signal, to avoid excessive heat generation and resultant cost associated with traditional Class A designs while nonetheless offering the exceptional degree of sonic clarity and openness of Class A operation. Additional features include: protection circuits to prevent speaker damage even if the preamp has a DC offset signal; front panel headphone jack and speaker selector switches; indicator lamps that monitor power-on and protection-circuit status. Specifications: harmonic distortion, 0.008 percent or less; signal-to-noise ratio, 115 dB; power output, 120 watts per channel, minimum RMS, both channels driven into 8 ohms from 20 to 20,000 Hz. Price for the unit is \$500.

## "State-of-the-Art" Bookshelf Speaker

J. B. Lansing claims that these L112 bookshelf loudspeaker systems are of "state-of-the-art" 3-way design, partly because they are designed as "mirror-imaged pairs." The L112 features a new 1-inch dome radiator, a 5-inch midrange speaker and a 12-inch low frequency transducer. A new, high-resolution dividing network provides smooth transition between the drivers, controlling each throughout its entire operating range. The woofer utilizes JBL's unique Symmetrical Field Geometry flux-stabilized magnetic structure; it delivers deep, extended low fre-



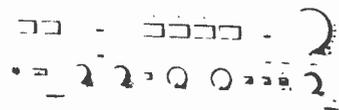
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quency response according to JBL. A powerful magnet weighing more than

10 pounds and a 3-inch copper edge-wound voice coil contribute to high power handling capability, low distortion and "outstanding" transient response. The midrange is housed in an isolated subchamber to prevent interaction with the low frequency driver. A new dome radiator is said to reproduce the highest harmonics with power and clarity. The system's enclosure measures 24½ inches by 14¼ inches by 13 inches, and is constructed of dense compressed wood panels veneered in American black walnut and lined with fiberglass to absorb unwanted resonances. The speaker can be driven by any amplifier delivering from 10 to 300 watts continuous sine wave per channel. Price: \$450 each.

## Medium-Priced Integrated Amplifier

Denon American's model PMA-550 integrated amplifier is rated at 100 watts per channel, with both channels driven into 8 ohms, and a total harmonic and intermodulation distortion below 0.005 percent. The unit may be direct-coupled from input to output by means of a front-panel switch; and it incorporates electronic switching for input sources, a separate record-out selector that permits the user to listen to one source while recording another, a subsonic filter, defeatable tone controls, and



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switching for two sets of speakers. Phono overload levels are 160 millivolts for the moving-magnet, and 8 millivolts for the moving-coil phono sections. Phono signal-to-noise ratios are 89 dB (MM) and 73 dB (MC), RIAA accuracy to within  $\pm 0.2$  dB. Tone-control turnover points are at 100 and 10,000 Hz ( $\pm 8$  dB) adjustment. The unit weighs 31 pounds and measures 17 inches by 16 inches by 5¼ inches. Price: \$595.

## "Gap-Closer" Cassette Deck

Yamaha claims this model K-950 cassette deck "closes the gap" between cassette tapes and discs, in terms of performance, while still providing the traditional benefits of tape, including elimination of dirt problems and uninterrupted playback of long selections. One reason for improved performance is the capability to play metal tape. Wow and flutter rated at 0.028 percent WRMS, results from use of an independent two-motor drive system. This spec, it's pointed out, is comparable to



# The secret of Onkyo.

Let Onkyo transport you to a world beyond electronics... to a world of more perfect sound. Where you'll hear music of such stunning purity and sensual richness, that you'll forget you're listening to an audio system.

That's the secret of Onkyo... and Onkyo's dramatic success. The unique ability to take you several steps beyond pure technology... to experience more exciting sound. And you'll find it in all our components... including all four of our new receivers.

The Onkyo TX-7000 Quartz-Locked AM-FM Stereo Receiver is an outstanding example. Both its power amplifier and FM sections are rich with important new design concepts.

The TX-7000's power amplifier provides two major innovations never before present in a stereo receiver. The first is called Super-Servo and it totally eliminates the sonic "ghost signals" common to DC power amplifiers. As a result, each instrument and voice sounds purer and more individually real... regardless of volume level. Perhaps for the first time, you'll experience stereo with true depth, spaciousness, and a remarkably discernable third-dimension.

The second innovation

is Linear-Switching which lets us provide Class A amplifier sound quality with Class B power efficiency. Crossover distortion is significantly reduced. And output power is very highly efficient... 90 watts per channel with no more than 0.02% THD.\*

The TX-7000's FM section is also clearly superior... picking up weak stations noiselessly and strong stations without distortion.

A unique Human Touch Sensor automatically controls the Quartz-Locked system for more reliable and convenient operation... releasing the system instantly when it senses your touch on the tuning knob... engaging it again as your fingers leave the knob.

Special circuits also monitor both channels... detecting and cancelling out sound distorting FM signal noise. Other circuits cancel out appliance noise.

Digital FM readout... separate bass, mid and treble controls... 2-way tape dubbing facilities... and dozens of other important features are all found in the TX-7000. And the TX-7000 is just one of four new

receivers from Onkyo. Hear "the secret of Onkyo" Hear receivers so advanced, they transcend mere technology. Onkyo USA Corporation  
42-07 20th Avenue  
Long Island City, N.Y.  
11105, (212) 728-4639



\* Minimum RMS at 8 ohms both channels driven from 20 to 20,000 Hz.

**The Onkyo TX-7000**  
A remarkably advanced new stereo receiver  
that provides dramatically superior sound quality.

# AUDIO SHOWCASE

the drive stability of a quartz-locked turntable. Frequency response is 30 to 22,000 Hz, 3 dB, with metal tape. The K-950 also features a pure plasma process sendust head for better frequency response and reduced dropout and modulation noise. The use of a core/coil design and silver wires substantially lowers head impedance to provide improved square-wave response, im-

proved linear-phase response at high frequencies, greater dynamic range and better channel separation, according to Yamaha. Other performance and/or convenience features include: a fluorescent bar-graph peak meter to facilitate

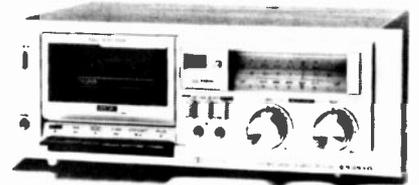
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On Reader Service Card



home recording; IC logic controls; continuously adjustable bias control; timer recording switch; subsonic and MPX filters; Dolby noise reduction; a focus switch to extend high-end frequency response, or to improve phase coherence. Suggested retail price: \$490.

## Affordable Metal Capability

Sanyo says this RD5009 cassette deck is another "first" because it offers metal tape capability at a price of only \$159.95. Other features include: Dolby noise reduction circuitry; instantaneous LED bar-graph meters to monitor input

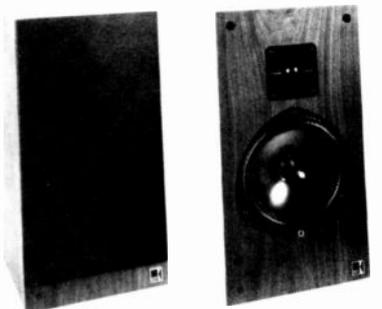


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levels or playback output; full auto-stop to disengage the mechanism at the end of the cassette tape to protect both the tape and deck transport mechanism; viscous-damped cassette door; mic/line mixing; digital tape counter with reset. The RD5009 is said to deliver a frequency response of 30 to 16,000 Hz  $\pm$ 3 dB with metal tape. Wow and flutter is put at 0.07 WRMS.

## Two-Way Bookshelf Loudspeaker

KEF Electronics' Reference Series Model 103.2 two-way bookshelf loudspeaker is said to use a 20 cm low-frequency driver that is mechanically isolated from its enclosure to reduce the transference of inertial forces and thereby greatly reduce coloration caused by cabinet resonance. Electrical compensation is also used to improve efficiency and provide highpass signal filtering. Electronic overload protection is in the form of an automatic self-powered device called S-STOP, which is an acro-



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nymn for Steady State and Transient Overload Protection. Because this protective device is so effective, the Model 103.2 is conservatively rated at 150

# Cleaning your records is only half the battle.

The best record cleaner in the world can't preserve a record. It can only clean it. A good record cleaner can remove dust, oily fingerprints and deep-seated dirt from the grooves. But, it can't protect the record from wear and friction.

The diamond is the hardest natural substance known. At the tip of a stylus, it is the spearhead of over 15 tons per square inch of destructive pressure that shears away microscopic chips of vinyl while traveling along the delicately thin grooves.

The finest high fidelity system can't restore the subtle high frequency and midrange tones that are unavoidably lost.

Sound Guard™ Record Preservative is a scientifically designed, ultra-thin, dry formulation that practically eliminates record wear. Your records treated with Sound Guard Record Preservative will sound just as good after 100 plays. No hiss. No pops. No clicks.

Give your records 100% protection with two simple steps. First, clean them with Sound Guard Record Cleaner; then preserve them with Sound Guard Preservative. Buy them separately or get them both in the Sound Guard Total Record Care System. And stop record wear in its tracks.



# sound guard

Sound Guard Corp. 348 S.W. 13th Ave., Pompano Beach, Fla. 33060  
Facilities: Cincinnati, Ohio; Tokyo, Japan; Brussels, Belgium.

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**"...an outstanding product on any absolute scale of measurement without regard to price." -STEREO REVIEW**



Read more of what Stereo Review magazine had to say about the Yamaha CR-840 receiver:

"The harmonic distortion of the CR-840 was so low that without the most advanced test instruments it would have been impossible to measure it."

When speaking of the OTS (Optimum Tuning System), an easy-to-use Yamaha feature that automatically locks in the exact center of the tuned channel—for the lowest possible distortion, Stereo Review said, "The muting and OTS systems operated flawlessly."

Among Yamaha's most significant features is the continuously variable loudness control. By using this control, the frequency balance and volume are adjusted simultaneously to compensate for the ear's insensitivity to high and low frequency sound at low volume settings. Thus, you can retain a natural-sounding balance regardless of listening level. As Stereo Review states, "...another uncommon Yamaha feature."

And there's more. Like the REC OUT/INPUT SELECT feature. These separate controls allow you to record from one program source while listening to another program source. All without disturbing the recording process. Stereo Review's comment was, "...the tape-recording functions of the CR-840 are virtually independent of its receiving functions." One could not ask for greater flexibility.

In summing up their reaction to the CR-840, Stereo Review said, "Suffice it to say that they (Yamaha) make it possible for a

moderate-price receiver to provide performance that would have been unimaginable only a short time ago."

And the CR-840 is only one example in Yamaha's fine line of receivers. For instance, High Fidelity magazine's comment about the Yamaha CR-640 receiver: "From what we've seen, the Yamaha CR-640 is unique in its price range."

And Audio magazine has remarks on the Yamaha CR-2040 receiver: "Without a doubt, the Yamaha CR-2040 is the most intelligently engineered receiver that the company has yet produced, and that's no small feat, since Yamaha products have, over the last few years, shown a degree of sophistication, human engineering, and audio engineering expertise which has set them apart from run-of-the-mill receivers."

Now that you've listened to what the three leading audio magazines had to say about Yamaha receivers, why not listen for yourself? Your Yamaha Audio Specialty Dealer is listed in the Yellow Pages.



To obtain the complete test report on each of these receivers, write: Yamaha International Corp., Audio Division, P.O. Box 6600, Buena Park, CA 90622.

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**fact:**  
the ultimate  
...made more  
affordable



**SHURE**

**SME**

**Series III S  
tone arm**

The designers of the award-winning Series III tone arm took on the challenge of developing a tone arm with essentially *the same* outstanding performance characteristics as the Series III, but at a significant reduction in price.

The Series III S tone arm is an instrument that is still definitely in the connoisseur class employing state-of-the-art materials and technology for unsurpassed strength-to-weight ratios in critical areas. Perfectionists will achieve the same flawless performance they have come to expect only in the SME Series III.

The tone arm and shell are combined into a one-piece "carriage carrier," which is removable and interchangeable. Coupling is close to the fulcrum so the carrying arm makes a minimum contribution to the Series III S total effective mass.

Tracking force and bias adjustments are controlled by a sliding weight adjustment. A fluid damping system is available separately.

**SHURE**

Shure Brothers Inc. 222 Hartrey Ave. Evanston, IL 60204  
Manufacturers of high fidelity components, microphones,  
sound systems and related circuitry

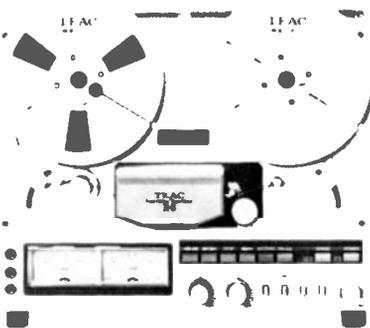
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## AUDIO SHOWCASE

watts. Specifications: frequency range, 60 to 20,000 Hz  $\pm$  2 dB; maximum output, 106 dB; nominal impedance, 8 ohms; program rating, 150 watts; size, 51 cm by 26.5 cm by 24 cm, weight, 19 pounds. Price: \$450 each.

### Streamlined Open-Reeler

TEAC's new offering is a three-motor, three-head open reel deck having "streamlined" dimensions. It is 16 inches wide by 13 inches high by an unspecified depth. The X-3 features a

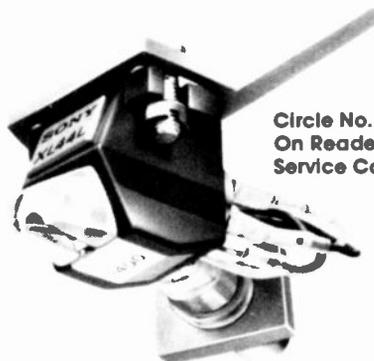


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DC servo-controlled capstan drive and two induction reel motors. Large compliance arms help maintain proper tape-to-head contact. Other features include: mic/line mixing; record mute; two-position bias and EQ selectors; fast-acting spring-loaded reel holders; and a head housing that is detachable for each of maintenance and editing. Price: \$550 for the deck.

### Cartridge for Low-Mass Tonearms

Sony's XL-44L moving-coil cartridge is designed to provide the "best" results with ultra-low mass tonearms. It weighs just 6.2 grams, for minimum tracking forces and good compliance. The nude super-elliptical diamond stylus has a special, narrow profile to yield extraordinary precision in tracing the high-



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Service Card

est frequencies of modern record grooves. Sony's exclusive figure-8 coil design offers higher efficiency and improved transient response. The suggested retail price is \$100.

### Four Compact Speaker Systems

Osawa's Heco Precision Series loudspeakers feature a patented woofer duct claimed to ensure accurate bass response. For precise midrange and high frequency sound, both soft dome midrange drivers and tweeters utilize a special polymer material made exclusively for Heco. To prevent the effects of spurious vibrations, the acoustic suspension cabinets are built of particle board that is "five times more dense than usually used for speaker cabinets." All four models have two environmental contour controls, a nominal DC impedance of 8 ohms, and an efficiency control rated at 91 dB/SPL (1 watt, 1 meter). The Precision 100 model, priced at \$339.95, has an 8-inch woofer, 1½-inch midrange and ¾-inch tweeter. Specs: frequency response, 35 to 25,000 Hz; crossover frequencies, 1,000 and 3,500 Hz; power handling, 60 to 110 watts. The Precision 200 (\$379.95) uses a 9¼-inch woofer, 2-inch midrange and ¾-inch tweeter. Specs: frequency response, 30 to 25,000 Hz; crossover frequencies, 700 and 4,000 Hz; power handling, 80 to 140 watts. The Precision 300 (\$449.95) utilizes a 70-inch woofer, 2-inch midrange and ¾-inch tweeter. Specs: frequency response, 25 to 25,000 Hz; crossover frequencies, 700

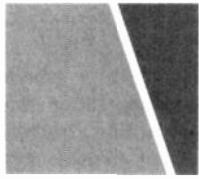


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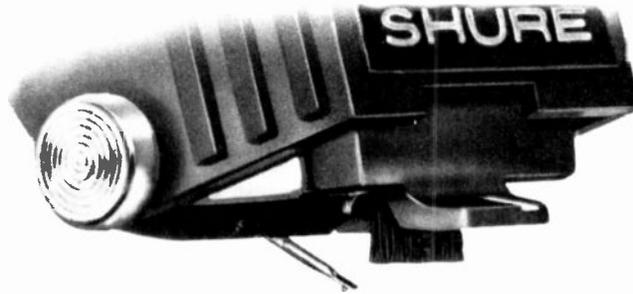
to 3,000 Hz; power handling, 100 to 170 watts. The Precision 400 (\$599.95) features a 12-inch woofer, 2-inch midrange and ¾-inch tweeter. Specs: frequency response, 25 to 25,000 Hz; crossover frequencies, 600 and 3,000 Hz; power handling capabilities are 120 to 200 watts.

### Minicomputerized Turntable

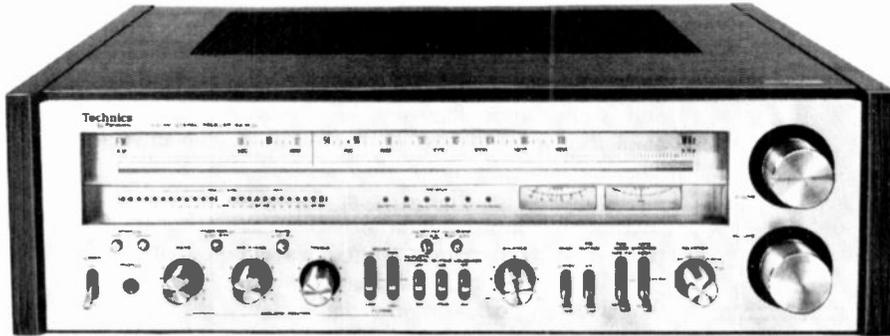
Sansui's Model XR-Q11 turntable features an internal minicomputer that can be programmed to play up to seven



**fact:  
calling this a "brush"**



**is like calling this a "radio"**



**we call it a Dynamic Stabilizer**

**...critics call it a major innovation**

True, the device on the front of a V15 Type IV cartridge bears a superficial resemblance to a cleaning brush.

In reality, it is a complex, exquisitely engineered subassembly which performs several complex functions that measurably enhance the quality of record reproduction!

Each one of its 10,000 conductive carbon fibers is positively grounded to discharge ever-present static electricity from the surface of your records. This eliminates static clicks and pops, as well as the tracking distortion produced by the varying electrostatic attraction between the record surface and the tone arm.

What's more, the Dynamic Stabilizer incorporates Shure-developed viscous damping that results in a uniquely efficient suspension system which maintains precise cartridge-to-record distance and uniform tracking

force—even on severely warped records. The stabilizer also acts as a shock absorber to cushion the stylus in case you accidentally drop the tone arm onto the record.

Finally, the tiny carbon fibers are so fine that 10 of them can fit *inside* a single groove to sweep free minute dust particles.

This integrated approach to pure sound reproduction extends throughout the design of the V15 Type IV. It sets a new standard of high trackability at ultra-low tracking forces—even on records that are warped, dusty, and charged with static.

If faithful reproduction of *all* your recordings is of paramount importance to you, we invite you to audition the V15 Type IV with the Dynamic Stabilizer. Or, write for the complete story (ask for AL569).



**V15 Type IV...the stabilized cartridge**



Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204, In Canada: A. C. Simmonds & Sons Limited  
Manufacturers of high fidelity components, microphones, sound systems and related circuitry.

# AUDIO SHOWCASE

selections on a record side in any desired order. After programming, the unit's operation is completely automatic from initial cueing to the final arm return and motor shut-off. Electronic sensors constantly monitor the operation to ensure smooth and accurate performance, and to protect the stylus and record. It has a "fail-safe" provision that shuts the turntable down and illuminates a warning indicator in the event of a malfunction. All controls are up front and outside the dust cover for convenience and added record protection. A dual-head magnetic sensing system measures platter speed by reading magnetic pulses. It has five times



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the accuracy of conventional systems, according to Sansui, and triggers a fast-acting quartz-servo speed correction system. Wow and flutter have been reduced to 0.015 percent, and signal-to-noise ratio is 78 dB. The tonearm is a patent pending DOB unit which makes use of optimum pivot-point technology. The straight, low mass arm is pivoted at the exact point that minimizes vibration transfer. Dynamic balance is said to be nearly perfect. The DOB arm suspension and special high-density BMC (Bulk Molding Compound) turntable base form an effective barrier against acoustic feedback. Even more feedback isolation and protection is provided by mounting the motor and arm on a rigid cast zinc sub-assembly within the turntable base. Suggested retail price: \$650.

### "Performance Standard" Speaker

Epicure Products claims this new Epicure 1.0 speaker system represents the company's "new performance standard" in small speakers by virtue of a unique ALS tweeter, an advanced crossover, and a new high-efficiency, high power capacity, low distortion bass driver. The mechanically inert ideal acoustical environment for the drivers to yield "extremely low coloration and extremely wide dynamic range." Specifications: frequency response, 50 to 20,000 Hz  $\pm 3$  dB; driver complement,

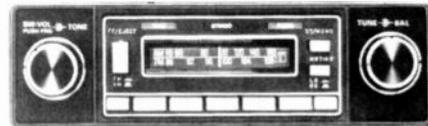


Circle No. 114  
On Reader  
Service Card

1-inch tweeter with low coloration diaphragm and acoustical loading sphere and ferro-fluid voice coil gap, and a 6-inch bass driver with long excursion potential and linear magnetic structure; crossover, 1800 Hz 18 dB/octave constant resistive type. The crossover conforms to Butterworth characteristics, uses no amplitude equalization, and has an impedance equalizer in the low pass section. The enclosure is of low resonance composite with a veneer of oiled walnut; the front of the cabinet is covered with foam to control diffraction, and the bass driver is mounted with vibration isolating fasteners. The grille is of acoustically transparent black cloth on a wood frame. The recommended amplifier power is 25 to 80 watts per channel. The unit weighs 18 pounds and measures 14½ inches by 10¼ inches by 8 inches. Price: \$175.

### Car Cassette Tape Player/Radio

Marume's M-P544 cassette tape player with AM/FM MPX radio, fader and five station pre-select tuning buttons also offers a built-in noise silencer system. The Marume silencer is said to



Circle No. 144 On Reader Service Card

reduce hiss and noise by more than 20 percent to provide greatly improved performance over car stereo systems not equipped with a noise reduction system. Other features include: a locking fast forward, reverse; local and long distance tuning; FM muting; Marume's exclusive compact design with a short chassis. The unit is claimed to deliver a strong 8 watts RMS of power per channel. Installation is easy. Player specs: wow and flutter, less than 0.3 percent; signal-to-noise ratio, more than 55 dB; channel separation, more than 35 dB; distortion, less than 2 percent. Tuner specs (FM): sensitivity, 55uV; signal-to-noise ratio, more than 45 dB; IF rejection, more than 55 dB; image rejection, 55 dB; distortion, less than 2 percent. The audio amp and general frequency response is 45 to 12,000 Hz. Dimensions: 7 inches wide by 4¾ inches deep by 1¾ inches high. Suggested retail price: \$169.95.

### Three-Way Full-Range Speaker System

Cambridge's model 310 three-way acoustic suspension loudspeaker offers several significant features. According to the manufacturer. First, it is said to have a deeper bass response than any other bookshelf loudspeaker. Its 3 dB down point at 27 Hz (competitors advertise 35 to 45 Hz points) allows the unattenuated bass content of new high-technology recordings to be heard without resort to sub-woofers or electronic bass enhancement devices. Power response is smooth, and flat to within  $\pm 1.5$  dB over a frequency range of 30 to 20,000 Hz, compared to up to  $\pm 4$  dB response deviations characteristic of most three-way systems at this price. The Cambridge 310 is claimed to reproduce uncompressed peaks well beyond 100 dB SPL without distress. Crossover networks are series parallel second-order designs with 12 dB octave slopes. They are built with saturation-free inductors that have insignificant resistance in the audio range. Crossover points are 520 and 4,000 Hz. Midrange and tweeter shelving controls are located on the face panel

(Continued on page 14)

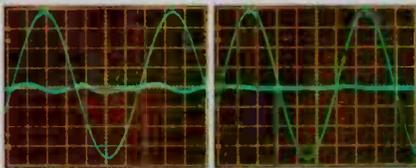
# Only JVC combines Super-A purity and graphic equalization in a receiver.



## Super-A **R-S33** FM/AM Stereo Receiver

Naturally, you want a receiver that gives you the most for your money. And only JVC gives you both Super-A amplification and graphic equalization.

You'll hear Super-A as pure, natural sound. Violins, cymbals, voices and other complex, delicate sounds are smooth and airy. That's because Super-A does away with most of the measurable switching and crossover distortion, a source of harshness in some conventional Class-AB receivers.



Class-AB Jagged center line indicates switching distortion.

JVC Super-A Minimal distortion in output waveform.

At the same time, you'll get plenty of power. The R-S33 shown here gives you *40 watts per channel minimum RMS into 8 ohms, from 20-20,000 Hz, with no more than 0.007% total harmonic distortion*. A regular Class-A amplifier with this kind of power would be heavy and expensive. But because it doesn't require high idling currents, the R-S33 costs and weighs about the same as a conventional receiver.

Even the most sophisticated amplifier can't correct cartridge peaks, speaker roll-off or room acoustics. Neither can it accommodate your changing tastes in sound as you take off Beethoven and put on disco. That's where JVC's 5-band SEA graphic equalizer comes in. With independent controls at 40 Hz, 250 Hz, 1 kHz, 5 kHz

and 15 kHz, it lets you extend the deep bass without creating boominess. Mellow out a voice without cutting the highs. Add brightness to the extreme highs and more.

With all this, the R-S33 has plenty of other features to recommend it: direct-coupling, a sensitive tuner section with linear-phase IF filters, two tape monitors with equalizer and dubbing facilities, LED power meters, and JVC's triple power protection system.

So if you're interested in getting more without paying more, call 800-221-7502 toll free for the location of your nearest JVC dealer (in N.Y. State 212-476-8300). Once you've heard the R-S33, you'll have no doubts about which receiver gives you the most for your money.

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### Two New Orchestral London Digitals.

The capacity of the digital recording process for capturing orchestral sound accurately, clearly delineating individual textures and providing a wide dynamic range are all obvious on London's newest digitals. Kiril Kondrashin conducts the Vienna Philharmonic Orchestra in a beautifully played but rather prosaic performance of Dvorak's *Symphony No. 9 in E Minor, Op. 95* (LDR 10011). The distinguished Russian conductor and the same orchestra are joined by Kyung-Wha Chung in a performance of Beethoven's *Violin Concerto in D, Op. 61* (LDR 10010). Chung's lovely sound has never been captured more realistically, and those looking for a new recording of this work surely will wish to investigate this disc. Both of these new digital recordings, in spite of their clarity, are rather lacking in warmth and resonance. There are many competing recordings of both works that offer the listener a bigger, more resonant sound.

Shostakovich: *Symphony No. 5, Op. 57*. New York Philharmonic, cond. Leonard Bernstein. CBS Mastersound IM 35854.

Bernstein has long championed this powerful symphony, and his earlier recording of it with the same orchestra is still in the catalog (Columbia MS 6115). However, the older recording, as well as all other recordings of this work, must bow to the superiority of this outstanding new version. Bernstein's reading is dynamic, propulsive, and while he may not quite capture the atmosphere of mystery that Stokowski finds in the third movement, he comes close to it. The New York Philharmonic gives their all, with engineering that is probably the finest ever afforded this orchestra. Recorded in Tokyo while the orchestra was on tour,



this was recorded before a live audience which apparently was so mesmerized they made not a sound. This is an auspicious beginning to Columbia's digital series, and comes highly recommended.

Saint-Saens: *Symphony No. 3 in C Minor, Op. 78*. Michael Murray, organist. Philadelphia Orch., cond. Eugene Ormandy. Telarc Digital 10051.

Recording the Saint-Saens Organ symphony presents a unique challenge for the engineers, as most concert halls do not have an organ appropriate for the score. Some previous recordings have solved the problem by dubbing in the organ. Telarc attempted to solve this puzzle by bringing the orchestra into the church, in this case St. Francis de Sales in Philadelphia. Indeed the organ there produces a thrilling, massive sound that has been captured by the engineers on this digital recording with uncommon solidity and impact. Unfortunately, the resonance of the church is not appropriate for orchestral sound. As a result, the famed Philadelphians are heard in a wash of rather blurred textures; there is little edge to the strings, and the cymbals, so important in the final quarter of this symphony, are decidedly lacking in brilliance. Obviously much time and preparation have gone into this production. While there are some mightily impressive bass sounds here, there are several other recordings of this colorful symphony that are equally impressive from the standpoint of the organ solo, far more realistic in their vivid depiction of a large symphony orchestra. My favorites would be the Deutsche Grammophon LP with Daniel Barenboim and the Chicago Symphony, or the RCA Victor LP with Charles Munch and the Boston Symphony, an old recording that sonically was ahead of its time.



### DBX Expands Catalog . . . With Spectacular Results

Public acceptance of the DBX encoding process discs must be considerable, as DBX has now expanded their listings, including some releases that are guaranteed to delight the sonic-minded. In the previous issue of *Hi-Fi/Stereo Buyers' Guide* I commented on some digital recordings made specifically for DBX, with the Philharmonia Hungarica directed by Zoltan Roznyai, which, in spite of the wide dynamic range, and freedom from distortion, were disappointing to me because of the small-sounding orchestra and sometimes careless execution.

But now DBX has released some new discs that are knockouts. The sonics are sizzling, and I imagine that many audiophiles will use *Morton Gould Conducts Morton Gould* as a demonstration disc (Varese Sarabande Digital PS 1009). The featured work is Gould's *Latin-American Symphonette*, along with *Festive Music, Philharmonic Waltzes*, *Quickstep* from *Symphony on Marching Tunes* and *Cotillion* from the ballet *Fall River Legend*. The orchestra is the London Symphony, and they are in fine form, playing these lively scores with verve and spirit. This digital recording is remarkable in its clean sonics and wide dynamic range, beautifully displayed in all of these scores, particularly so in the third movement, *Guaracha*, from the *Symphonette*. The performance is conveyed with total absence of background noise of any kind, and the dynamic range will astound.

Brahms: *Concerto in A Minor, Op 102*. Itzhak Pearlman, violinist; Mstislav Rostropovich, cellist. Amsterdam Concertgebouw Orch., cond. Bernard Haitink. Angel SZ 37680.

The mighty Concertgebouw Orchestra has recorded exclusively for Philips, (Continued on page 70)

An avid record collector for almost a quarter of a century, Thomas D. Kelly has a keen ear for both live music and full-fi sound. Mr. Kelly played the records he reviews here on equipment consisting of a Tanoy/Micro Turntable with a Shure V15 IV cartridge, a C/M Labs 911 stereo amplifier, a Marantz 7T pre-amp, and two Bozak B-400 speakers.

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theater, concert hall, and auditorium—the Koss K/4DS Digital Delay System offers the most life-like and realistic portrayal of a live performance you've ever heard. Ask your audio dealer for a live demonstration, or write c/o Virginia Lamm, for more information on the K/4DS or other famous Koss stereophone and loudspeaker products. Now that the price of admission is so low, you won't want to miss the missing link in stereo.

*Suggested retail \$459*

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# AUDIO SHOWCASE

(Continued from page 10)

under the black knit grilles. Driver complement consists of a 1-inch dome tweeter, 4½-inch cone midrange, and 10-inch woofer with a 1½-inch long-throw voice coil. The nominal system



Circle No. 56 On Reader Service Card

impedance is 8 ohms, and actual impedance does not drop below 6 ohms at any frequency from 30 to 20,000 Hz. The system is said to operate comfortably at output levels up to 104 dB SPL, and will handle up to 200 watts peak input on music programs, so it can safely be used with the latest superamps. Price: \$349.

## AM/FM Stereo Receiver

Radio Shack's new low-profile AM/FM stereo receiver (Realistic STA-720) comes in a brushed champagne-silver metal cabinet with an easy-to-read digital frequency display for precise tuning. The unit measures only 3½ inches by 16½ inches wide by 12¼ inches deep. Besides the four-digit frequency display, the receiver sports a five-level LED signal strength indicator and LED mode indicators. The unit is rated at 25 watts per channel, minimum RMS into 8 ohms from 20 to 20,000 Hz with no more than 0.05 percent total harmonic distortion. Phono signal-to-noise ratio is put at 81 dB; the auxiliary input is rated 92 dB. The FM tuner (IHF) sensitivity is 1.9; microvolts (10.8 dBf), the capture ratio is 1.0 dB, stereo separation is 45 dB at 1 kHz, and the signal-to-noise ratio is 70 dB. An exclusive Auto-Magic® circuitry fine tunes FM stations

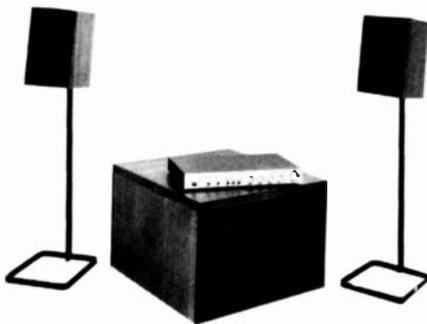


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and automatically locks on to the frequency for cleanest sound. A new integrated circuit in the phono preamp is said to lower distortion while maintaining proper RIAA equalization for better sound from LP records. Other features include: full tape monitoring circuitry, detented bass and treble controls, and a four-detent volume control. The amplifier is fully protected against overheating and overload. Price: \$299.95.

## Powered Bass/Satellite Speaker System

This ADS SubSat 2300 Powered Bass/Satellite system is claimed to produce "big sound" from little boxes. The system consists of a pair of new "larger" miniature loudspeakers (ADS 400), an ADS PB-1500 Powered Bass Module, and an ADS C-1500 Bass System Control. The powered bass module consists of a low-profile cabinet housing two 10-inch *Stifflite* woofers in separate acoustic suspension chambers and two 100 WRMS power amplifiers. The C-1500 bass system control is a "sophisticated" crossover/equalization system having "unusual control flexibility." It can be connected between an existing preamplifier and power amplifier, or in a tape monitor loop of a receiver/integrated amplifier. The ADS 400 mini-



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loudspeaker is a 1-inch soft-dome acoustic suspension tweeter with a single-layer, high-temperature metal voice coil. A 7-inch *Stifflite* woofer features honeycomb tapered cone construction to provide optimum mass/stiffness ratio and low sonic coloration, according to ADS. The system can be wall mounted, placed on a bookshelf or be used free standing by means of optional F400 floor stands. Price: \$1495 for the entire system.

## Deluxe Optimum Low Mass Tonearm

Sumiko says this Grace 747 tonearm is intended for use with the latest high compliance, moderate weight cartridges of both magnetic and moving coil design. A detachable headshell incorporates a wide surface coupling mechanism to eliminate vibration and reson-

ance between the tube and headshell connection. Self-cleaning electrical contacts that depend on an automatic rubbing action ensure superior surface contact. Silver wire is used to minimize "skin effect" resulting in loss of high frequencies (especially valuable with moving coil cartridges). There are improvements in the anti-skating and



Circle No. 74 On Reader Service Card

cuing devices, and there is the convenience of one-hole mounting. An improved orthogonal bearing system featuring a case hardened bearing cone tip reduces friction and increases durability. A decoupled counterweight includes a rubber damper that dissipates one resonance into two lesser, inaudible ones. The tonearm also has a highly rigid, well-damped aluminum tube arm to provide ideal stiffness-to-weight ratio. Price: \$275.

## Patch Bay System

Audiovisual Systems offers the first studio-quality Patch Bay System designed for audiophiles and recordists. It features 16 stereo inputs and outputs (256 two-channel crosspoints), with 64 gold-plated RCA phono connectors on the rear panel and three-conductor Bantam jacks on the front. No patch cords are necessary for normal system operation. Cords may be inserted to break normal connections, and insert or rearrange components or signal-processing devices. Once set up, there is no further need for access to



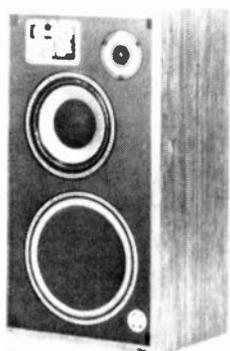
Circle No. 57 On Reader Service Card

the rear of any equipment. Front panel phono connectors enable connection of external equipment anywhere in the system. The system comes with two patch cords and instructions, for \$540.

## "Tri-Dimensional" Speakers

RTR Industries' Model G-80 uses a passive driver in conjunction with a woofer and tweeter to create a linear transient response that the manufacturer calls "tri-dimensional" by virtue of a claimed "musical spaciousness and realistic reproduction." A passive radiator tuned enclosure improves the bass response, increases efficiency and offers lower distortion as compared to sealed

enclosure systems. There are no vent tube resonances or breathing. The enclosure filters out unwanted internal radiation and reduces modulation distortion compared to conventional vented designs. A precisely tuned enclosure also eliminates muddy, boomy bass according to RTR. An articulate woofer features a large diameter, Hi-Temp voice coil for reliable operation. Cone compositions are said to be formulated for optimum energy absorption characteristics to minimize "break up" and standing waves, thereby ensuring smooth response throughout the crossover region. A high definition, 1-inch soft dome tweeter offers extended wide dispersion response, free of resonances throughout its operating range. Other features include: precision crossovers.



**Circle No. 75 On Reader Service Card**

resettable circuit breaker, variable tweeter control (for choice of "concert hall" or intimate "near field" effects). Specs: frequency response, 35 to 22,000 Hz; crossover, 2,400 Hz; nominal impedance, 4 ohms; recommended amplifier power, 10 to 100 watts unclipped. Price per speaker is \$179.

#### In-Dash Stereo Radio/Cassette

Fujitsu Ten designed this model DP-644 combination radio and stereo cassette deck for use in small imported and American cars. It's a high power, in-dash AM/FM/MPX radio/auto-reverse stereo cassette deck. Power output is a full 16 watts per channel into 4 ohms, 30 to 20,000 Hz, at 10% harmonic distortion. The unit measures only 7 inches wide by 1½ inches high by 5½ inches deep, and features separate bass and treble controls, DSS bass boost for listening at low volumes, FM muting, built-in noise blanker and an FM stereo indicator light. In addition to auto-reverse, the cassette player offers locking fast forward and rewind, chrome and metal tape capability, durable high fidelity LTM head, cassette eject switch and tape direction indicator lights. Tuner specs: FM usable sensitivity, 20 dBf; 50 dB quieting sensi-



**Circle No. 59 On Reader Service Card**

tivity, 24 dBf; selectivity, 64 dB at 400 kHz; FM stereo separation, 35 dB; frequency response,  $\pm 3$  dB from 30 to 15,000 Hz. Tape section specs: frequency response,  $\pm 3$  dB from 40 to 10,000 Hz; wow and flutter, 0.2% VWRMS; signal-to-noise ratio, 52 dB; stereo separation, 40 dB. \$249.95.

#### "Music Emulating" Speaker

This model IM-98 Impression speaker from American Acoustics Lab is claimed to provide crisp highs, rich midrange sound and tight, deep bass to emulate the original musical performance without coloration or distortion. The 8-inch, two-way speaker features a woofer with 1-inch voice coil and 8-ounce magnet, and a 1-inch tweeter with 1-inch voice coil and 10-ounce magnet. Specifications: frequency range, 42 to 22,000 Hz; impedance, 8 ohms; minimum required power, 5 watts; maximum power handling, 45 watts; crossover frequency, 1500 Hz; cabinet size, 20 inches by 12 inches by 9¼ inches. Bass driver cones are formed of a special material that exhibits a high rigidity-to-mass ratio for instantaneous transient response. Durable closed cell foam surrounds maintain compliance consistency for true bass response, and venting is tuned to optimize bass response. Each woofer is equipped with a double bump back plate that prevents bottoming; this



**Circle No. 58 On Reader Service Card**

is to provide an extra measure of protection against damage when the speaker is overdriven. Both drivers are centered on a single vertical line, and flush mounting eliminates a protruding rim that could cause unwanted diffraction of high frequencies. Price: \$129.

#### Record and Stylus Care Kit

Cecil Watts' latest addition to the firm's record care line is a three-piece Record and Stylus Care Kit that provides a non-liquid system for record care. The kit includes the best-selling Parostatik Disc Preener, Parostatik Anti-Static Fluid and Watts Stylus Cleaner. Experts are said to recommend a humid system for record cleaning because free use of liquid cleaners can interfere with tracking. Modern cartridges, with their ultra lightweight tracking, cannot easily push or ride through wet or hardened liquids to make the proper contact with record grooves. The stylus is literally

**Circle No. 55 On Reader Service Card**

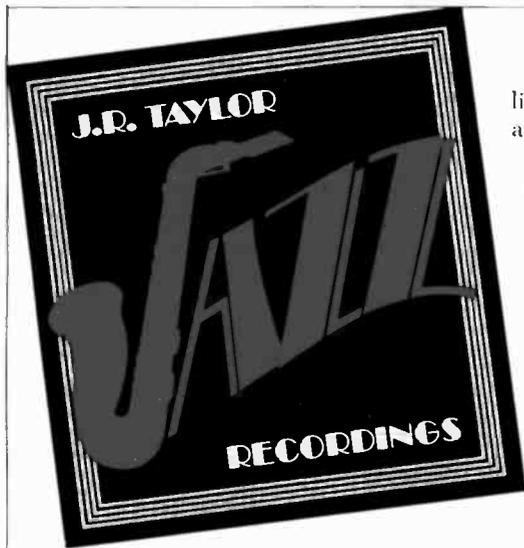


forced to ride over residue, which leads to distortion. Watts record cleaning devices are used in a semi-dry or slightly moist state and, according to the company, do not leave a film or residue on the record. The new kit is priced at \$13.95 suggested retail.

#### High-Tech Mid-Size Speaker

Altec Lansing's new Model 8 mid-size speaker is priced at \$450, for which you get a low-frequency driver consisting of a 12-inch cast alloy frame and deep well magnet structure, a 5-inch mid-frequency driver and, for ultra-high frequency, an LZT compression driver. To build the compression driver into this small speaker, Lansing had to find a way to reduce the size and price of the key component. The answer was LZT (lead zirconate titanate), a space age semiconductor material that directly converts electrical energy into physical motion, replacing the conventional magnet and voice coil in the driver. Additionally, a new passband network was developed to couple the LZT driver to the other components; this network is said to provide less distortion and increased efficiency over conventional crossover networks. Specifications: nominal impedance, 8 ohms; crossover frequencies, 700 and 5000 Hz; enclosure type, vented; sensitivity, 92 dB SPL; frequency response, 55 to 20,000 Hz;  $\pm 2.5$  dB; dynamic range, 50 dB; amplifier operating range, 20 to 200 watts.

*(Continued on page 66)*



**Bill Evans: *We Will Meet Again*.** Evans, piano, electric piano; Marc Johnson, bass; Joe LaBarbera, drums; Tom Harrell, trumpet; Larry Schneider, tenor and soprano saxes, alto flute. Warner Brothers HS 3411.

Evans has toyed with many recording formats since the 1950s, but most of his work on record has kept to the piano-bass drums trio setup of his working band, and he has hardly ever used the trio-with-horns approach that dominated jazz recording for so long. *We Will Meet Again* is surprising not only in its format, but in its success. Schneider and the superb Harrell have thoroughly absorbed the gentle feel of the Evans trio, and he in turn has risen to the challenge of their presence with playing that is more definite, less ruminative, more clearly punctuated and rhythmic. If you've found Evans too sleepy in recent years, listen again. He's still growing.

**The Trumpet Summit.** Dizzy Gillespie, Freddie Hubbard, Clark Terry, trumpet; Oscar Peterson, piano; Joe Pass, guitar; Ray Brown, bass; Bobby Durham, drums. Pablo Today 2312-114.

You might imagine that Hubbard, who spent most of the 1970s looking for the elusive big hit, would be out of place in the company of two such stalwarts as Terry and Gillespie. In fact, it is Gillespie who lets this record part of the way down, with poorly articulated playing that we hope represents nothing worse than an exceptionally bad day in the studio. Meanwhile, Hubbard is heard in Gillespian idioms unusual for him, as if he were deliberately standing in for the lapsed master. Terry, at his least complacent when challenged by another outstanding trumpeter, proves a match for Hubbard; and even with

little help from Gillespie, they produce a raw, invigorating jam.

**Max Roach: *M'Boom*.** Roach, Roy Brooks, Omar Clay, Fred King, Ray Mantilla, Warren Smith, Freddie Waits, Joe Chambers, Kenyatte Abdur-Rahman, various percussion. CBS Mastersound IC 36247.

This decade-old ensemble here receives its first recording. Fortunately for the subtleties of *M'Boom's* timbre and texture, the digital process is at work to preserve each nuance. Though this music may seem exotic to some, it is more than a tangential off-spring of jazz; and its infinite variety of instruments has been carefully balanced, providing depth and definition as well as a broad range of mood. Not for all listeners, but a welcome discovery for those who'll take the chance.

**Max Roach: *We Insist! Freedom Now Suite*.** Roach, drums; Abbey Lincoln, vocals; Booker Little, trumpet; Coleman Hawkins, Walter Benton, tenor sax; Julian Priester, trombone; James Schenck, bass; Micheal Olatunji, Ray Mantilla, Tomas du Vall, percussion. Columbia JC 36390.

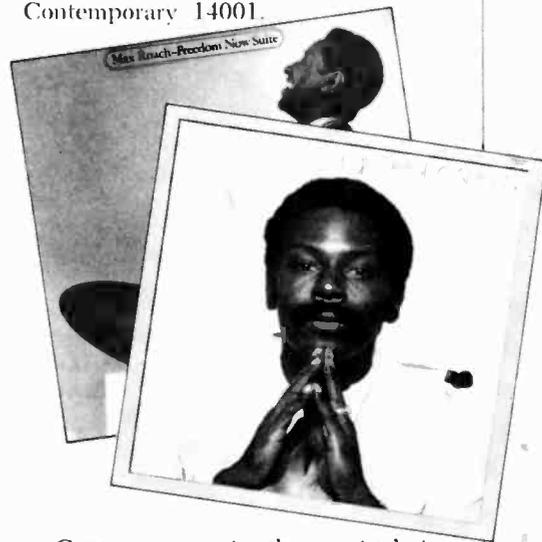
This was recorded in 1960 on the Candid label, which folded despite outstanding releases. Two other companies reissued large parts of Candid's catalog, but failed to include the increasingly notorious *Freedom Now Suite*, which had already stirred political controversy on its first issue. Today, the political implications of the *Freedom Now Suite*—revulsion against slavery, pride in African Heritage, outrage against racial discrimination—seem ordinary and unarguable, and the *Suite* must rest on its respectable but not outstanding musical merits. Roach and his then-wife Abbey Lincoln did considerably better work elsewhere. Little, his band's best soloist, is not much used; and Hawkins, his guest, seems out of place. Though moving at times, particularly in the opening *Driva' Man* and *Freedom Day*, this seems destined for increasingly historical interest.

**Ran Blake: *Film Noir*.** Blake, piano; Daryl Lowery, soprano, alto, and tenor saxes; Paul Meyers, electric bass and electric guitar; Hazilla, drums; with Ted Curson, trumpet; John Heiss, flute; and students of the New England Con-

servatory of Music. Arista Novus AN 3019.

Several years ago, I noted the cinematic, dreamlike qualities of Blake's solo playing; so naturally enough this album, comprised entirely of movie themes and Blake's own compositions based on his obsessive and encyclopedic filigging, seems to me an almost inevitable development in his work. Not so inevitable is his increasingly fertile collaboration with other musicians, after devoting the first third of his career to unaccompanied keyboard. His quartet with Lowery, Meyers and Hazilla and all his students in the New England Conservatory's Third Stream Department, is a group quite unlike any other. Still ambiguous enough to hold his cult audience, Blake's music here is decidedly closer to general jazz tastes, and could serve as an entry to his solo discs for those who haven't yet heard.

**George Cables: *Cables' Vision*.** Cables, piano, electric piano; Freddie Hubbard, fluegelhorn, trumpet; Ernie Watts, soprano and tenor saxophones, flute; Bobby Hutcherson, vibes; Tony Dumas, bass, electric bass; Peter Erskine, drums; Vince Charles, percussion. Contemporary 14001.



Contemporary is the purists' jazz label *par excellence*, with nothing even remotely smacking of compromise in its quarter-century of existence. Its slightest gesture in the direction of commercial appeal would seem shocking, if not so tastefully executed as on this, Cables' debut as a leader. This veteran of the Freddie Hubbard and Dexter Gordon bands will please casual listeners (note *Morning Song*) while leaving space (as on *Byrdlike*) for the buff. Ex-boss Hubbard and major vibist Hutcherson bolster the pianist; and don't forget Contemporary's standards of fidelity, as long-established as their artistic rectitude. ▲

*J. R. Taylor is with the Smithsonian Institution's Jazz Program. He has written on music for the Washington Post Book World, the Village Voice and others.*

# To understand EPI's Linear Sound, look at it this way.

Since 1968, we at EPI have sought to develop the best possible loudspeaker systems. And central to our definition of "best" has been the concept of *Linear Sound*:

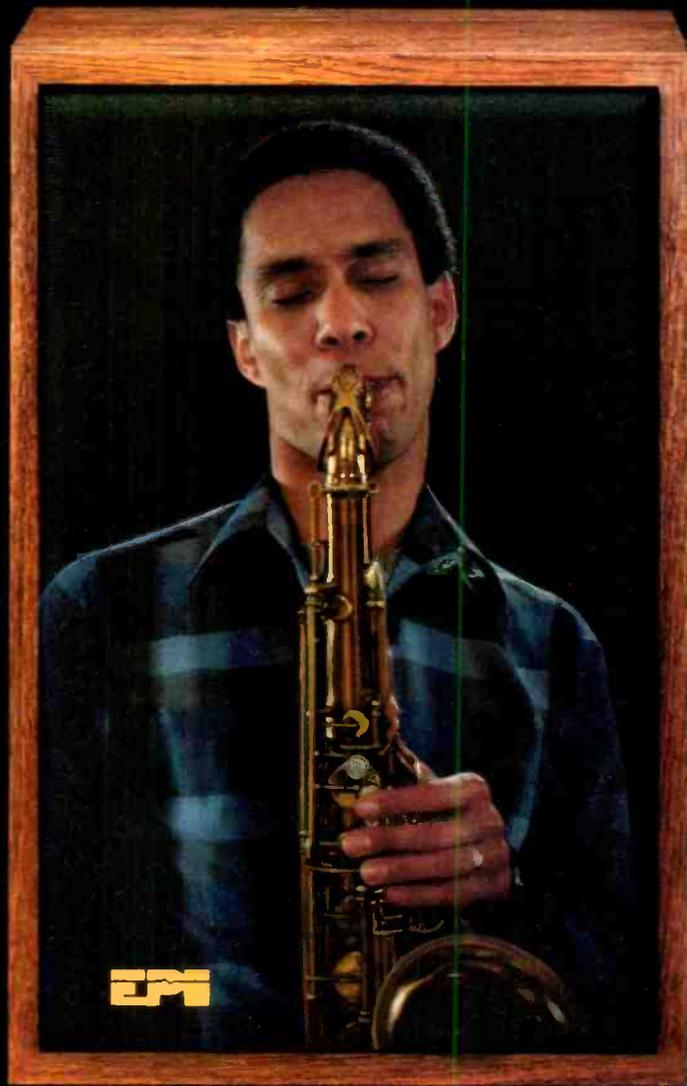
That is, the reproduction of sound exactly the way it emerges from the artist's instrument or voice. With nothing added to the original performance, and with nothing taken away.

Needless to say, Linear Sound is easier to define than to achieve. Yet our speakers come remarkably close to making it a reality.

There are a number of reasons for this.

There's our celebrated one-inch, air-suspension tweeter, which offers remarkable frequency response (1800 Hz to 20,000 Hz) and truly extraordinary dispersion.

To match its performance, we developed outstanding woofers that faithfully reproduce sound from the midrange all the way down to the musical fundamentals. Their light, stiff cones resist "break-up," while they maintain efficiency and allow accurate transient reproduction.



Of particular interest to audiophiles is our employment of *ferro fluid*, a unique magnetic fluid used to fill the voice coil gaps in each and every EPI tweeter.

Originally developed for the space industry, this precious fluid automatically aligns our tweeters for an exceptionally smooth, "silky" high-end sound. We pioneered its use in the high fidelity industry, and it's typical of our precision engineering techniques.

Which brings us to another critical point: for reasons of performance and quality control, we design and build all our own drivers.

So carefully matched in efficiency are our tweeters and woofers that, in all but the most

complex EPI speakers, only the simplest crossovers are used to provide bass-treble transition.

What we've described to you here are but a few of the many reasons why the Linear Sound of EPI is virtually indistinguishable from its live origins.

For a closer look at the entire line of EPI speakers, we invite you to write for our brochure.



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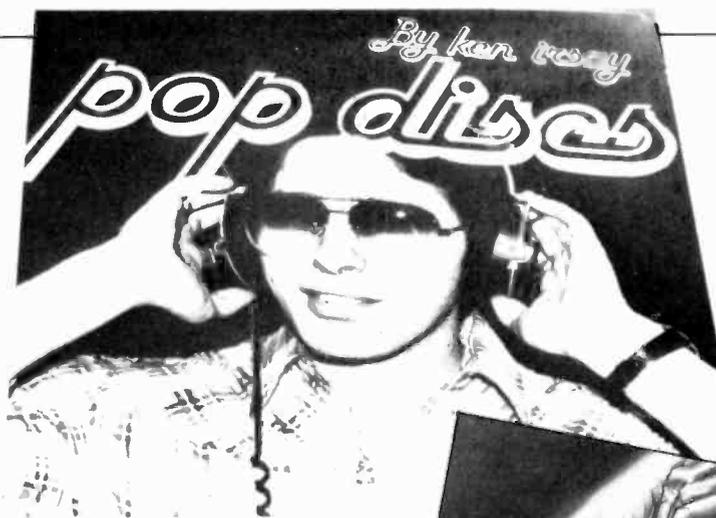
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**Bob Dylan: *Saved*. Columbia. \$8.98.**

All of the gospel power and evangelical energy hinted at in last year's *Slow Train Coming* explodes in a geyser of rock/religious emotion as Dylan pulls no punches in a set combining the foot-stomping "Solid Rock" and "Pressing On" with the delicate and touching "Covenant Woman." Effective use of gospel background singers completes the package, which is produced by the winning combo of Jerry Wexler and Barry Beckett.

**Blue Oyster Cult: *Cultosaurus Erectus*. Columbia. \$7.98.**

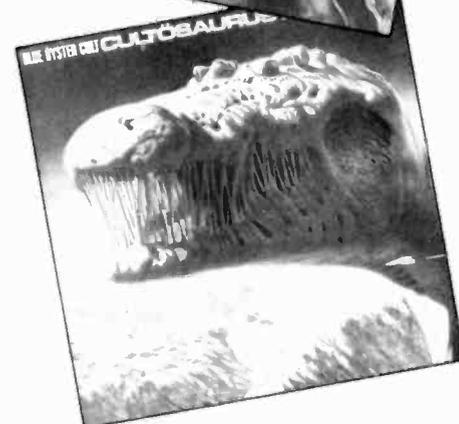
The sound of this musical slugfest is as primitive as the title, but the New York-based quintet has amassed quite a loyal following by delivering a combination of gut level hard rock and often mystical lyrics of doom and foreboding. To each his own.

**Eric Clapton: *Slow Hand*. Mobile Fidelity. \$16.98. Earl Klugh: *Finger Painting*. Mobile Fidelity. \$16.98.**

These two half-speed remasterings, pressed on high quality, super quiet vinyl, artfully display the craftsmanship of two ace guitarists. On the Clapton album, the delineation between the guitar and thumping bass is especially clear, while the cymbals tread lightly above the mix. In areas where blending is preferred ("Lay Down Sally") the sense of separation between lead and double-channel harmony vocals can be a bit disconcerting. For sheer high fidelity nirvana, the acoustic guitar plucks and strums on the Klugh disc are so sharp that you'll feel you're inside the instrument. Catch the spine-tingling bell transients on "Long Ago & Far Away".

**Jeff Beck: *There & Back*. Epic. \$8.98.**

Beck's guitar wails like a train whistle and ricochets like a bullet, but those strings can also sing like a violin. The swirl of Jan Hammer's synthesizer surrounds Beck's impassioned



guitar on three tracks. This virtuoso performance is a must for rock and jazz fans of all persuasions.

**Suzanne Fellini. Casablanca. \$7.98.**

As with many others in the current wave of strutting, swaggering female rockers, Suzanne Fellini belts out tough, no-nonsense (although somewhat adolescent) lyrics, set in a basic instrumental matrix of drums, keyboards, bass and guitar. But—surprise, surprise! On slower cuts like "Give Me The Light", she produces the soaring sustained vibrato of a truly gifted and accomplished singer. ▶

*These records were reviewed using the following equipment: Technics SL-5300 turntable with a Discwasher antistatic mat; three interchangeable phono cartridges—Shure V-15 IV, Stanton 681-EEE/S and Audio Technica AT-25; Kenwood KA-8500 integrated amplifier; ADC Sound Shaper 3 parabolic equalizer; BIC F-4 speakers; and Koss Pro-4 AAA headphones.*

# IF YOU'RE NOT USING THE SCOTCH<sup>®</sup> RECORD CARE SYSTEM, YOU'RE USING THE SECOND BEST.

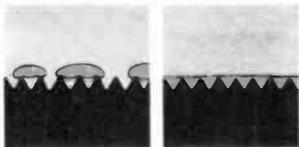
INTRODUCING SCOTCH<sup>™</sup> RECORD CARE SYSTEM. IT CLEANS,  
ANTI-STATS AND REDUCES FRICTION—ALL IN ONE STEP.

Finally there's a way to give your records the kind of care and protection that hasn't been possible until now... a way to insure a long life of true sound.

#### The System.

The Scotch Record Care System combines new Sound Life<sup>™</sup> fluid with a unique dispensing applicator. To use, simply depress the supply container and Sound Life fluid is fed automatically to the pad. That's all there is to it. It's quick, easy and simple. No guesswork about how much fluid you need or how to apply it correctly. Just place the applicator on your turntable spindle, revolve it and the record is cleaned.

**Super-wetting action deep-cleans grooves.**



*Discwasher D3<sup>®</sup> solution (left) beads up on the grooves. Sound Life (right) with super-wetting action deep-cleans grooves.*

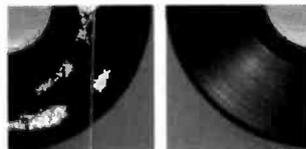
If your present cleaning solution beads up on the record surface, it may not be getting the job done.

Scotch Sound Life spreads onto the disc surface evenly—safely penetrating grooves to remove micro-dust and fingerprints. Sound Life leaves the record with a brilliant look, as brilliant as the sound is clean and true.

#### As it cleans, it wipes out static.

Even though your record surface is clean, it's generally the electrostatic charge that gets it dirty again. An anti-static gun is just a temporary treatment.

One application of Sound Life reduces the residual charge to near zero. And it prevents static from returning no matter how often the record is played.



*(Left) Styrofoam beads are attracted to static charge left on record after cleaning with Discwasher D3<sup>®</sup>.*

*Same record (right) after one treatment with new Sound Life fluid.*

#### Friction reduction's a plus.

The same application of Sound Life that super-cleans and removes static can reduce stylus drag up to 15%.

And with your sensitive stylus that can mean less wear and improved record life.

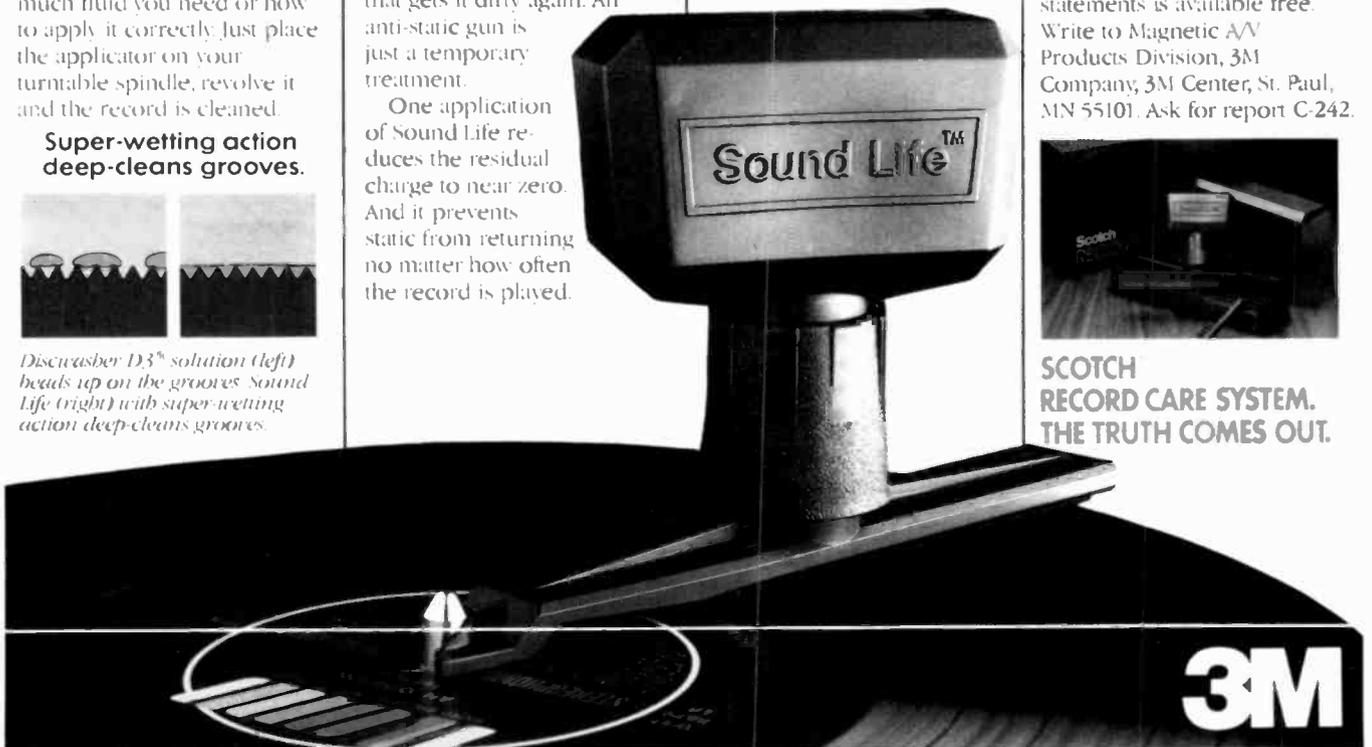
#### Better stereo performance.

To get all the true, pure sound you expect from your stereo, you need records that are truly clean, and protected from static and friction. Only the Scotch Record Care System gives you all three in one application. Ask to see a demonstration at your record or stereo store right now.

All of the tech data we've used to back up these statements is available free. Write to Magnetic A/V Products Division, 3M Company, 3M Center, St. Paul, MN 55101. Ask for report C-242.



**SCOTCH<sup>™</sup>  
RECORD CARE SYSTEM.  
THE TRUTH COMES OUT.**



Grace Slick: *Dreams*. RCA. \$7.98.

Working within producer Ron Fran-  
gipone's highfalutin' rock/Latin/semi-  
classical instrumentation, Slick's dra-  
matic, wide ranging voice carries this  
first solo LP, as it did many of the Jef-  
ferson Airplane/Starship discs over the  
years. It's a tribute to her vocal quality  
that Grace so often surmounts fre-  
quently overblown arrangements.

Anne Murray: *Somebody's Waiting*.  
Capitol. \$8.98. Glen Campbell: *Some-  
thin' 'Bout You Baby I Like*. Capitol.  
\$8.98.

These two artists took root in coun-  
try music, but their turn toward the  
pop mainstream brought their greatest  
successes. Highlighting Campbell's  
thirty-ninth album are two duets with  
Rita Coolidge, the uptempo title track  
and a sumptuous ballad, "Show Me  
You Love Me." Anne Murray has a  
"digital" voice whose sharpness and  
clarity effortlessly slice through the  
limitations of straight analog recording.  
She explores new areas here with a re-  
vival of the Beatles' "Happy Just To  
Dance With You" and the 'Twenties  
tune, "Nevertheless."

Nervous Rex. Dreamland. \$7.98.

Ahh... those deliciously simple har-  
monies and catchy pop/rock hooks of

the 1960s are back for another visit.  
If you liked the Searchers, Herman's Her-  
mits and Gerry & The Pacemakers  
but you're slightly more sophisticated  
now, this New York quartet featuring  
male and female lead singers is for  
you. The songs are inoffensive and ap-  
pealing to many tastes.

Snic 'n' The Tears: *The Game's Up*.  
Atlantic. \$7.98.

This brainy British quintet fuses a  
soft, smoothly textured rock style with  
close vocal harmonies, while lyrically  
viewing the world through dark-colored  
glass shards. The album's Eagles-like  
title cut declares, "There's evil out  
around the town, people waiting to cut  
you down." Frequently moody arrange-  
ment reflect the serious lyrics.

Southside Johnny & The Asbury Jukes:  
*Love Is A Sacrifice*. Mercury. \$7.98.

Johnny Lyon's gravelly voice con-  
trasts sharply with William Rush's  
razor sharp guitar in this conceptual  
rocker detailing the ins and out (also  
the highs and lows) of love relation-  
ships. A lively horn section and hefty  
rhythm unit keep things moving along  
at a good clip.

rockers, ballads and a tribute to Elvis  
Presley featuring Mark Knopfler on  
axe. The lyrics are imaginative and in-  
telligent, and the arrangements far ex-  
ceed the boundaries of formulaic rock.

Frankie Miller: *Easy Money*. Chrysalis.  
\$7.98.

Miller's soulful presentation combines  
straight-from-the-gut vocalizing with  
unexpected lyrical emotional vulner-  
ability ("Forget About Me"). The al-  
bum is rock-funk, featuring a heavy  
bass sound and solid rhythm section.  
Stereo imaging is exceptional; sound  
fills the room. ▲

Graham Parker & The Rumour: *The Up  
Escalator*. Arista. \$7.98.

The Rumour is one of the most musi-  
cally aggressive, no-frills British rock  
bands recording today. They're the  
perfect complement to the accusatory  
vocals of Graham Parker, a pioneer  
new wave "angry young man" who  
sings of "Stupefaction" and "Empty  
Lives" with conviction, impact and  
authority. Fellow grouch Bruce Spring-  
steen guests on "Endless Night." As  
always, Brinsley Schwarz's hot guitar  
sets the instrumental pace.

BRAM TCHAIKOVSKY  
PRESSURE



Philip D'Arrow: *Sub Zero*. Polydor.  
\$7.98.

Whichever way the musical trends  
blow, D'Arrow is covered. The author  
of last year's rock anthem, "Burn The  
Disco Down," can barely sing, but  
he's pulled together a band that show-  
cases hard rock, rhythm & blues, reg-  
gae-rock and a delightful 1950s-style  
ballad, "Kiss Don't Run." Another high-  
light is "Upper Side of Town," which  
has the ragged, earthy sound of the  
early hits of The Band.

Philip Lynott: *Solo In Soho*. (Warner  
Bros. \$7.98.

Usually hollering like the dickens as  
part of a stereophonic ten-car collision  
known as Thin Lizzy, Lynott turns in  
a fine, restrained solo vocal performance  
in a series of self-composed, moderate

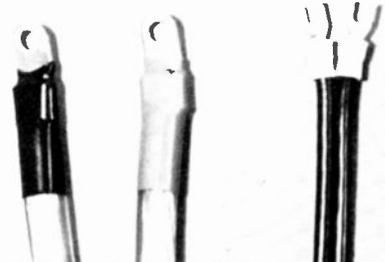
Sandy Farina: *All Alone in the Night*.  
MCA. \$7.98.

What a set of pipes on this kid!  
High-powered instrumentation doesn't  
faze her; she puts her all into each  
song, from the big band sound of  
*Walkin' In Sunshine* to the soft tender-  
ness of *Broken Pieces*. This is thrush  
Farina's first album; it won't be her  
last.

Bram Tchaikovsky: *Pressure*. Polydor.  
\$7.98.

After a semi-hard rock debut LP  
and Top 40 single last year, former  
Motor Tchaikovsky (that's the group,  
The Motors) adds a bit more pure  
power to his tank this go 'round with  
a punchy set of self-compositions plus  
four heavies by bassist/guitarist/key-  
boardist Mickey Broadbent. ▲

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Monster or Mogami. Fulton Gold does  
indeed possess the virtues of Fulton Brown to  
an even greater degree." —Neil Levenson,  
Fanfare, Nov. Dec. '79

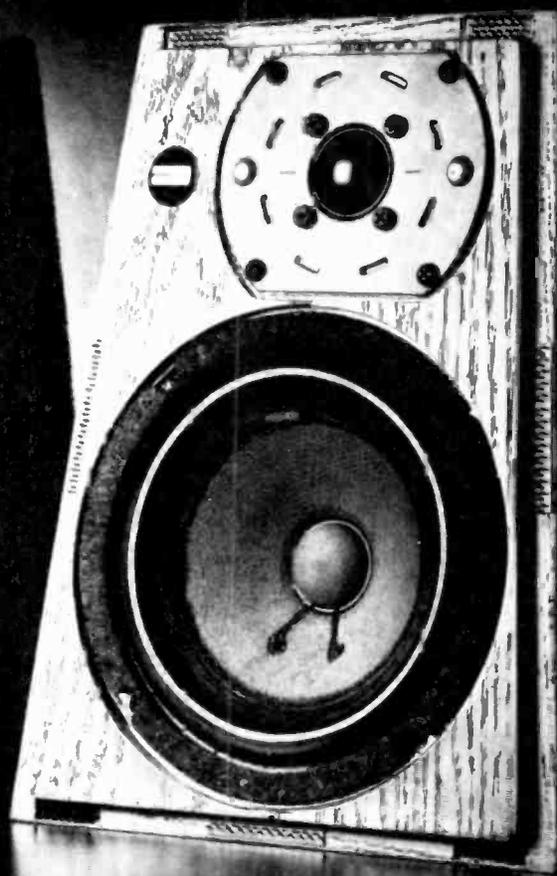
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# When it comes to performance, size doesn't count...anymore.



Up until now the sound quality of mini-speakers was exactly what you probably imagined... minimal. Minimal bass response. Minimal power handling capacity. Minimal definition.

That was until ADC perfected the incredible new MS-650 mini-speaker system. The only thing small about it is its size.

Here's why. Unlike conventional mini-system drivers that can overheat and distort under high power, both the MS-650's 1" polyamide soft dome tweeter and 6 1/2" high compliance woofer are specially cooled with ferrofluid in the voice coil gap for better frequency response, lower distortion and greater power handling.

They're so effective the new MS-650 mini-speaker system can handle up to 50 watts of power! But what's even more amazing is that while it can handle all that power, it doesn't need it. A mere 20 watts input produces an awesome 102dB output. That's enough to wake the neighbors. And the whole neighborhood. But that's not all.

To further enhance sound quality

the MS-650's feature an effective combination of first and higher order crossover networks for a smooth, natural transition between high and low frequencies. That's a big difference between the crossover systems most mini-speakers use.

But the differences don't stop there. The MS-650's unique non-parallel cabinet sides were computed to allow a gradual termination of midrange frequencies at the cabinet edge. The sound you'll hear will be more natural...at all levels. Even the front face is sloped for improved phase coherency. To minimize the adverse effects of cabinet resonances, the MS-650 is constructed of Isocor T.F.M., a specially formulated non-resonant material.

The new ADC MS-650 mini-speaker system. The only thing small about it, is its size.

For your nearest ADC dealer or more information call (800) 243-9544 or write Audio Dynamics Corporation, Pickett District Road, New Milford, Connecticut 06776.

**MS650**  
**MINI-SPEAKER**   
A BSR COMPANY

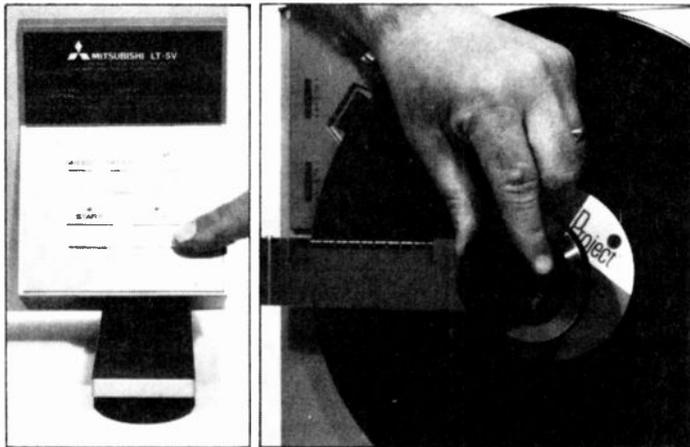
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## MITSUBISHI LT-5V

*A unique, well engineered turntable that delivers great performance. Why didn't someone think of this sooner?*

△ Every few years we get another "breakthrough in the state of the art" and yet another linear-tracking turntable is introduced, with the usual assortment of learned papers supporting the advantages of high pivot, low pivot, long tonearm, short tonearm, spring compensated VTF (Vertical Tracking Force) non-spring compensated VTF, etc., etc., etc. Occasionally, one system proves viable as a high fidelity device, but either fails to win sufficient consumer acceptance or proves to be somewhat delicate in terms of mechanical adjustment and reliability.

The latest entry in the linear-tracking turntable sweepstakes is the Mitsubishi LT-5V, which just might get con-

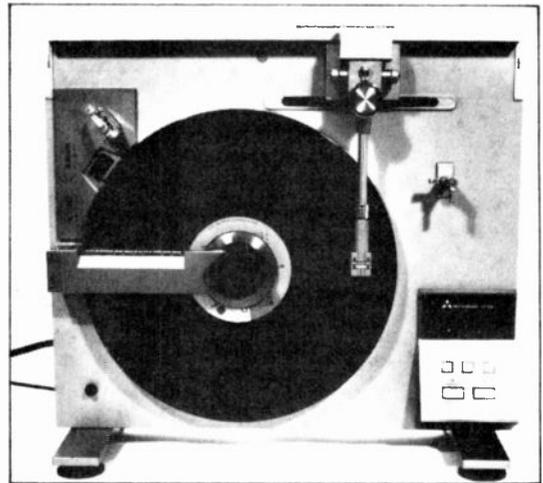


*Left • Five pushbuttons control the operation. Small indicators above the switches show the operating mode and whether the tonearm has stabilized and is operating tangent to the record. Right • A rotating pad at the end of a swing-arm presses the record against the platter to help maintain a steady operation.*

sumer acceptance (which it deserves) because it incorporates a totally new concept that appears to work well, and because it is one magnificent piece of machinery.

First, the LT-5V plays records while standing on end and the tonearm hangs straight down. Thanks to this the weight of the pickup itself has no effect on the VTF (We were tempted to call it HTF [Horizontal Tracking Force], but since the force is still vertical with respect to the record disc, we'll stick to VTF). If the user were to change to a pickup having a different weight it would have no significant effect on the tonearm balance. (The tonearm's VTF adjustment applies a rotating force that unbalances the tonearm towards the record.) Because of this balanced condition, the very same adjustment that provides, say, 1.5 grams VTF, would apply about 15 to 20 grams if the record player was placed flat on a table. In short, the turntable must be used vertically.

The LT-5V is a two-speed record player with individual strobes and pitch controls for the 33 and 45 rpm speeds. A prism beams light rays at two photocell sensors via smaller prisms buried in the turntable mat. When both sensors receive the light rays (because there's no record



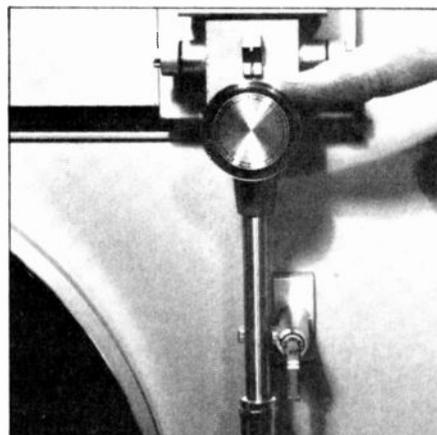
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on the platter) the tonearm will not swing into the platter under any condition. When a 7-inch record covers one sensor the player shifts to 45 rpm and the tonearm indexes at 7-inches. When both sensors are covered by a 12-inch record the player shifts to 33 rpm and the tonearm indexes at 12-inches. A speed selector will over-ride the automatic speed selection; i.e., to play one of the 45 rpm 10-inch records, or 33 rpm 7-inch discs.

At the end of play the tonearm cycles to the rest and the motor turns off, or the player can be programmed for repeat play. Switches provide tonearm lift, track left or right when lifted, stop (reject) and start. A positive lock on the tonearm rest also serves as the master power switch. Turn the power off and the tonearm is automatically locked into the rest; or lock the tonearm and the power is turned off.

Because the player is vertical the record must be secured to the platter. This is done by a swing arm with a rotating pressure pad at its end. The pad presses the record against the platter until deliberately released by the user.

The "biggie," of course, is the linear-tracking tonearm. What's interesting is that it's neither short nor long, and the pivots are about where they would be if it were a standard "horizontal" tonearm. The pickup mounts in a plug-in universal carrier. It would be hard to come up with some new theory for this tonearm because it's sort of a vertical version of (Continued on page 73)



• The tonearm hangs down from a pivot. An unbalancing force, which is dialed in directly, causes the tonearm to move towards the record and apply the tracking force. The stylus force range is 0 to 2.5 grams in 1 gram increments.



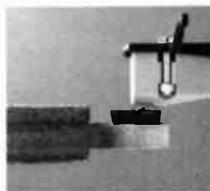
# Give your cartridge more than The Finger!

## Give it Stylus Care With the new Discwasher SC-2 System.

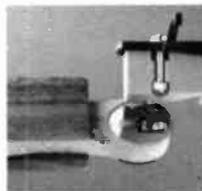
The famous SC-1 stylus brush (standard of the record and hifi industries) now has a synergistic fluid called SC-2.



New Fluid



Nylon Brush



Inspection Mirror

SC-2 Fluid enhances and speeds cleaning and yet protects diamond adhesives, cartridge mounting polymers and fine-metal cantilevers against the corrosive effects of many other "cleaners".

The Discwasher SC-2 System. Stylus care you can finger as clearly superior.



## SC-2 Stylus Care System



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## INFINITY

RS<sub>a</sub>

△ One of the glories of stereophonic sound is that it instantly transports you to other musical times and places. Whether you fill your home with one of the spectacular sound studios off California's Route 1 or with Carnegie Hall, what you hear should recreate, very realistically, spaces and sounds far away from where you are. We think Infinity's new RS<sub>a</sub> does as honest a job of this as any speaker we've heard.

Since its main purpose is music and not looks, RS<sub>a</sub> has an unassertive presence in a room. A carefully applied dark oak veneer over the sides of the enclosure and a dark brown cloth grill make a handsome, reserved package measuring 25 inches high, 14 inches wide, and 10 inches deep. At 33 pounds, it's right in the middle range of bookshelf speakers.

Now to the all important innards. Once the rigid grill is popped off, the front surface looks reasonably like the same part of any other acoustic suspension loudspeaker. A look at the 10-inch woofer, though; reveals a speaker cone made of a material unlike anything we're used to seeing. It's made of polypropylene, an uncompromisingly strong, light plastic the BBC developed to prevent buckling of the surface and to assure a precise piston action. Even the bullet-shaped shell that shields the voice coil is of this same stuff. To be as effective as it can, a bass driver must damp any spurious resonances set up by its motion. The

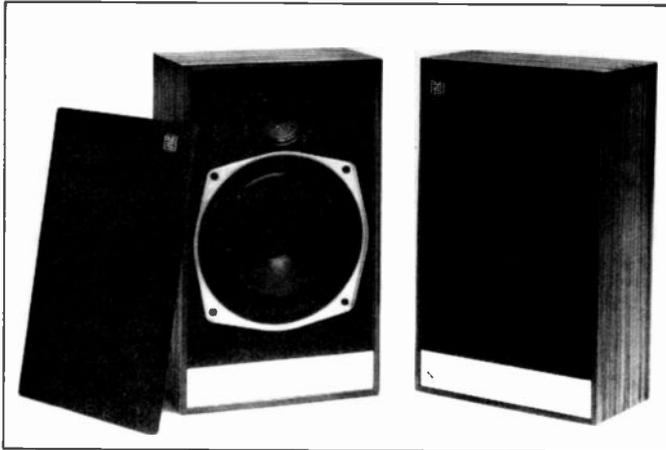


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polypropylene that forms the cone is compounded to be acoustically dead, so unwanted flexings of the surface stay at a minimum. The air trapped behind the woofer, inside the box, serves to help limit the cone's movement to what the audio signal tells it to do. Too much "throw" makes a woofer sloppy, so this additional damping assures a firm, simple response to the bottom notes.

The real attraction of this speaker is its radical new tweeter. Stereo images are delicate things. To reproduce  
(Continued on page 71)

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## MORDAUNT-SHORT

CARNIVAL SERIES 2

△ Maybe our imagination is running away with us, but sometimes we think a loudspeaker's nationality shows in its voice. We've known American speakers that sounded forthright and foursquare—some of them were even a bit forward and brash. And now this little package from England seems to be making music with an Oxford accent: quite reserved, polite, and smooth, yet with a kind of sturdy self-assertion.

The Mordaunt-Short Carnival Series 2 isn't exactly a mini-speaker. Still, it's not much bigger than a shoebox for

somebody with big feet. But since good-sized feet aren't a common yardstick, perhaps we'd better be precise: 9½ inches wide, 15¾ inches high, and the unusually shallow depth of 5¾ inches. This makes the speaker right at home even on slim bookshelves. Its weight of 11¾ pounds lets you know right off that there is nothing flimsy about this beautifully built little number, whose handsomely paneled cabinet (walnut or teak) has the solid feel of a tightly fashioned wooden ship's hull. There's evidence of care and craftsmanship... and no frills. For example, there's no tweeter control and no fancy trim. Just a plain and unobtrusive deep-brown woven fabric grille that draws no undue attention to itself. Apparently the designers felt that the frequency balance should be adjusted with the tone controls at the receiver or amplifier, and that the speakers should be heard but not seen. That is a British notion, too!

If you listened to the Carnival 2 blindfolded, you'd never guess its size. It sounds much bigger than it is. Not that the bass is huge. But enough of it is there so you never feel any lack of it. The key to this remarkable size-performance ratio is Mordaunt-Short's superb 6-inch DBS 208 driver, which handles the low end and the mid-frequencies. By combining a long-throw voice-coil with a cone impregnated with viscous material for internal damping and suspended in a compliant plastic surround that provides additional damping, a double purpose is served: 1) The cone can swing far enough to put real punch into those lows; 2) Its motion is so well controlled that it makes no false moves despite its wide excursions. The net result is surprisingly ample bass without any of the usual side-effects of overdriven woofers, such as frequency doubling, lack of definition, looseness, and other forms of low-fre-  
(Continued on page 74)

# THE REALIZATION OF GREAT EXPECTATIONS.

## THE SANSUI "Z" SERIES.

Music lovers expect uncommon products from Sansui. And Sansui delivers. The Sansui "Z" Series of synthesized digital receivers are designed and built with a loving logic that can be seen, touched and heard. Take the Sansui 5900Z, a reasonably priced receiver with every important feature you could possibly want for the heart of your high fidelity system.

### SYNTHESIZED DIGITAL TUNING

You can't mistune a Sansui synthesized digital receiver. Not even a little. Press the up/down tuning buttons. The digital circuitry ensures that every station received is automatically locked in for lowest possible distortion, with its frequency indicated both on a digital readout and by an LED indicator along an analog type dial.

### TOUCH VOLUME CONTROL & LED PEAK POWER LEVEL INDICATOR

The Sansui 5900Z uses a pair of touch-buttons to adjust the listening level. Relative volume control setting is indicated on a fluorescent display. Actual peak power amplifier output is shown by 14-segment LED indicators.

### 12 PRESET STATIONS

To make FM and AM tuning still easier, up

to 12 user-selected stations may be "stored" in the 5900Z's memory circuits for instant recall. The last station received will be remembered when the tuner is turned on again; and memories are kept "live" even during a power outage.

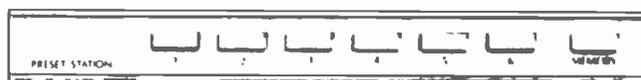
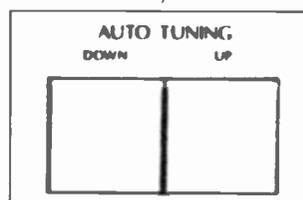
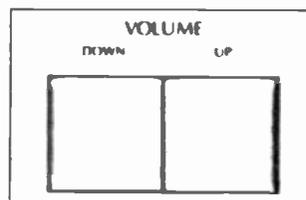
### DC-SERVO AMP FOR DEPENDABLE POWER

The leader in DC technology, Sansui uses a servo-controlled amplifier circuit in all "Z" receivers to eliminate unwanted ultra-low frequencies — like record warps — while maintaining the advantages of direct-coupled circuitry in their amplifier sections. The 5900Z delivers 7.5 watts/channel, min. RMS, both channels into 8 ohms, from 20-20,000Hz, with no more than 0.03% THD.

And there's more. Like LED's for every important function. Two Muting Modes. Two tape deck connection with dubbing. And much more.

Visit your Sansui dealer and make sure you

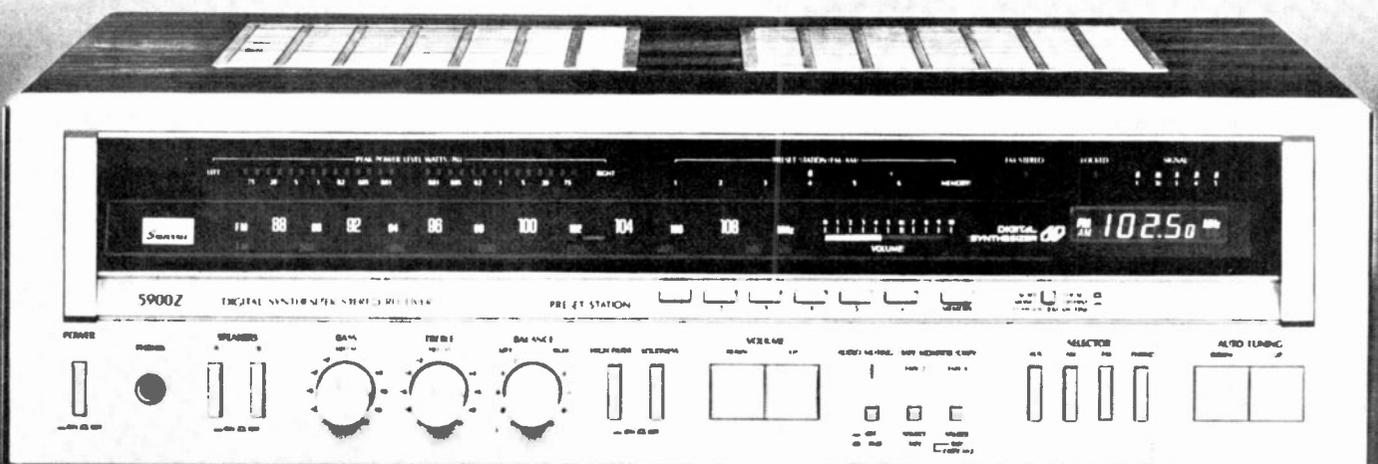
see all the wonderful stereo receivers in the Sansui "Z" Series. And expect great things. You won't be disappointed.



**SANSUI ELECTRONICS CORP.**

Lyndhurst, New Jersey 07071  
Gardena, Ca 90247

SANSUI ELECTRIC CO., LTD., Tokyo, Japan  
SANSUI AUDIO EUROPE S.A., Antwerp, Belgium  
In Canada: Electronic Distributors



Circle No. 9 On Reader Service Card

hi-fi stereo  
BUYER'S GUIDE  
NOVEMBER/DECEMBER 1989

# Headphones

Your personal concert hall

By George W. Tillet

AKG 34C





AUDIO-TECHNICA ATH-2



JVC HP-1100

△ Modern stereo headphones are vastly different from the cumbersome models we had to contend with years ago: they sounded rather like a telephone and even the best were uncomfortable to wear for more than an hour or so. During the past four or five years, considerable progress has been made with special lightweight magnetic "rare earth" materials such as Samarium, low-mass plastic diaphragms and various loading techniques to obtain a wide frequency response with low distortion.

A fairly recent development is the open-air, or velocity design which involves the use of complex vents at the rear of the earpiece to reduce diaphragm pressure and so produce a more spacious unboxy sound. Most of these models have earpieces that rest on the ears instead of fitting around them (circumaural). The disadvantage of open-air types is the fact that the extraneous noises are not shut out, so if you want to listen to Bach or Brubeck in your own private world, buy the closed-back kind.

Headphones are not that easy to test properly because their performance is somewhat dependent on the characteristics of the human ear, which can differ considerably. In order to measure the frequency response, the headphones have to be coupled to the microphone by something called an "artificial ear" which is intended to simulate an "average ear." Needless to say, there are several standard couplers (all giving different results) but the one now used by many authorities is the B&K 4153 which is quite similar to the type employed for our measurements. But it must be emphasized that the frequency response

measurements can only be a general guide, so when you buy headphones—choose those that sound right to *your* ears! Most listeners seem to prefer a somewhat bumpy frequency response in headphones. Here are the *details* of the tests:

1. *Sensitivity:* the manufacturers' figures are given, plus our measurements of the sound power output (SPL, or sound pressure level) when a 1 kHz signal of 1 volt is applied.

2. *Distortion:* Again, in order to facilitate comparisons, distortion (THD) at 1 kHz was measured at a SPL of 100 dB—which is very loud!

3. *Output:* The maximum output was measured in terms of SPL before the signs of overload were audible.

4. *Comfort Rating:* As this is highly subjective, a panel of four (two adults and two teenagers) was pressed into service.

You will notice that the impedances vary between 20 and 400 ohms. This is not usually important, although there will be a power loss with very low impedance phones when they are used with amplifiers or receivers having a series resistor or 200 to 300 ohms. Finally, a word of warning: always make certain that the amplifier's volume control is turned down before you plug the phones in!

**AKG 340 \$189.00**

**Specifications**

*Type: Circumaural, hybrid velocity-sealed back*

*Sensitivity: 94 dB SPL at mW.*

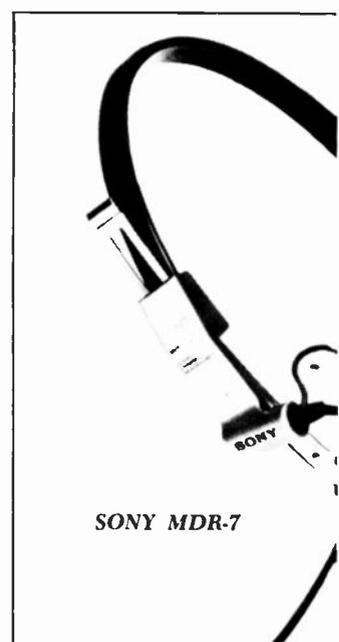
Illustration by Douglas Gray



**KOSS HV/X**



**PICKERING OA-5A**



**SONY MDR-7**

*Distortion: Less than 1% at 104 dB SPL*  
*Impedance: 400 ohms*  
*Lead length: 9.8 feet*  
*Weight: 13½ ounces*

AKC's 340's are hybrids in more than one sense because high frequencies above 4 kHz are handled by an electret electrostatic driver while the lower frequencies are fed to a fairly conventional dynamic transducer. Bass is augmented by five "slave" or passive diaphragms which begin to operate from 200 Hz. They radiate into a secondary sound chamber which is vented to the air, thus the response becomes more like a velocity type. However the passive diaphragms function like acoustic resistances at the higher frequencies so the characteristics then approximate to a closed-back design. Most ingenious!

The earpieces are larger than usual at 4 inches in diameter and, like the twin headband, they are finished in black, relieved by a polished aluminum ring. The earpads are made of soft foam and are detachable for cleaning. The headband support is made from black plastic nicely padded and there are adjustments at each end while the earpieces themselves are suspended by a universal joint.

**Test results**

*Output at 1 volt: 98 dB SPL*  
*Maximum output: 117 dB SPL*  
*Distortion at 100 dB SPL: 0.76%*  
*Comfort rating: A,B,A,B.*

The frequency response had a gradual rise from 1 kHz to 4 kHz, falling slightly before increasing again at about 8 kHz. The response continued smoothly to a peak at 18 kHz before

rolling off from 20 kHz. At the low end, output was very smooth down to 100 Hz when it increased slightly before falling gradually from 60 Hz with a significant output as low as 30 Hz.

Overall sound quality was characterized by that uncolored, spacious effect typical of electrostatic transducers—plus a clean but solid bass. Brass and percussion instruments were reproduced with an impressive clarity while vocalists had a pleasing presence which was not exaggerated. The 340's are not particularly cheap at \$189 but I believe they are worth every penny. Circle number 66 for more info.

**AUDIO-TECHNICA ATH-2 \$49.95**

**Specifications**

*Type: Open-air, velocity*  
*Sensitivity: 98 dB at 1 volt*  
*Distortion: Less than 0.8% at 110 dB SPL*  
*Impedance: 20 ohms*  
*Lead length: 8 feet*  
*Weight 7 ounces approx.*

Instead of a conventional voice coil, this model has a flat spiral diaphragm which moves the air directly. The stainless steel headband is highly polished, matching the trim on the brown plastic earpieces. These are about 2¼ inches in diameter and have soft plastic pads (not detachable). A wide plastic support is mounted under the metal headband, and there are two adjustments while the earpieces are suspended by a kind of universal ball joint.

**Test Results**

*Output at 1 volt: 106 dB SPL*  
*Maximum output: 116 dB SPL*  
*Distortion at 100 dB SPL: 0.5%*  
*Comfort rating: A,A,A,B.*

The frequency response had a broad peak in the 2 kHz to 3 kHz range, followed by a smooth output to 10 kHz where there was a small peak. Response fell off gradually from another rise at 15 kHz. At the low end, output began to rise at 400 Hz to a maximum at about 100 Hz continuing at this level to 60 Hz where it fell gradually to 40 Hz before rolling off more sharply. Sound quality was characterized by a slightly "larger than life" presence which was very pleasing with jazz groups and vocal items. Bass was clean but not over-emphasized. Circle number 67 for more info.

**JVC HP-1100 \$79.95**

**Specifications**

*Type: Open-air, velocity*  
*Sensitivity: 102 dB/mW*  
*Distortion: NA*  
*Impedance: 100 ohms*  
*Lead length: 9 feet 9 inches*  
*Weight: 7 ounces*

Apart from some polished metal trim around the 3-inch earpieces, the HP-1100's are finished entirely in black. The headband is made from aluminum and the soft plastic support underneath has two adjustments. The earpieces are swivel-mounted so permitting a certain amount of movement in any direction.

**Test Results**

*Output at 1 volt: 94 dB SPL*  
*Maximum Output: 120 dB +*  
*Distortion at 100 db SPL: 1.65%*  
*Comfort rating: A,A,B,B,*

The frequency response had a rise from 1 kHz to a maximum at 4 to 5 kHz falling to a lower level which was



maintaining this level up to 14 kHz before gradually falling off. At the low end, output increased below 200 Hz, continuing at the same level down to 60 Hz and rolling off from 50 Hz. The sound quality was notable for a rather "forward" midrange with a clean but restricted bass response. Transient response was good. These phones come with an adaptor to permit connection to the miniature socket often found on portable radios and tape recorders. Circle number 70 for more info.

#### **SONY MDR-7 \$79.95**

##### *Specifications*

*Type: Open-air, velocity*  
*Sensitivity: 101 dB at 1 mW*  
*Distortion: NA*  
*Impedance: 55 ohms*  
*Lead length: 9 feet 9 inches*  
*Weight: 2 ounces*

Sony says the MDR-7's are "as easy to wear as your hair" which may or may not be true! However, they are extremely lightweight and the earpieces are only just over 1½ inches in diameter. The single strip headband is covered with a dark grey plastic and it is adjustable by means of a sliding bracket on one side. Metal parts have a satin silver finish and the earpiece pads are made of blue foam plastic. If you don't like the color, a pair of black ones are also supplied.

##### *Test Results*

*Output at 1 volt: 106 dB SPL*  
*Maximum output: 115 dB SPL*  
*Distortion at 100 dB SPL: 0.75%*  
*Comfort rating: A,A,A,A.*

The frequency response had a gradual rise from 1 kHz to 5 kHz, falling to 9 kHz and then rising at 17 kHz before rolling off. At the low end, output increased below 600 Hz, reaching a maximum at 100 Hz and rolling off from 50 Hz. Sound quality was somewhat "forward" with a good, but not predominant bass plus a crisp transient response. All-in-all, overall results were remarkably good for phones of such a "micro" size. Circle number 71 for more info.

#### **YAMAHA YH-100 \$95.00**

##### *Specifications*

*Type: Circumaural, closed-back*  
*Sensitivity: 98 dB at 1 mW*  
*Distortion: less than 0.3% at 90 dB SPL*  
*Impedance: 150 ohms*  
*Lead length: 7 feet 8 inches*  
*Weight: 13½ ounces*

maintained from 7 kHz to 14 kHz and rolling off at 18 kHz. At the low end, output began to increase from 400 Hz reaching a high output at 80 Hz, before gradually falling to 40 Hz before rolling off. Sound quality was characterized by a heavy, full bass with a smooth but restrained upper-midrange—a "back row, center" effect. Circle number 68 for more info.

#### **KOSS HV/X \$69.95**

##### *Specifications*

*Type: Velocity, open-air, circumaural*  
*Sensitivity: 100 dB at 1 volt*  
*Distortion: Less than 0.5%*  
*Impedance: 85 ohms*  
*Lead length: 12 feet 6 inches*  
*Weight: 10 ounces*

This model is one of the few velocity type designs using a circumaural ear pads. These are made of soft brown plastic material, over 3 inches in diameter and are easily detachable for cleaning. The spring steel headband has two adjustment sliders and a separate wide plastic band is mounted underneath it. This is finished in brown, matching the plastic earpieces which are suspended to give free movement in any direction.

##### *Test Results*

*Output at 1 volt: 103 dB SPL*  
*Maximum output: 123 dB +*  
*Distortion at 100 dB SPL: 0.45%*  
*Comfort rating: A,B,A,B.*

The frequency response showed a gentle rise from 1 kHz to a small peak at 10 kHz falling to 15 kHz and followed by another rise at 19 kHz before rolling off. At the low end, output increased below 400 Hz to a maximum at 150 Hz. Response began

to fall from 60 Hz, rolling off more sharply at 40 Hz. Overall sound quality was distinguished by a full, solid bass with a smooth midrange and crisp transient response. Like most Koss phones, the HV/X's will handle a great deal of power and levels over 120 dB were reached before they showed signs of overload—and that's really loud! Model HV/XLC is similar but it features built-in volume controls.

Circle number 69 for more info.

#### **PICKERING OA-5A \$60.00**

##### *Specifications*

*Type: Velocity, open-air*  
*Sensitivity: 110 dB at 0.20 volts*  
*Distortion Less than 0.25% at 110 dB SPL*  
*Impedance: 100 ohms*  
*Lead length: 10 feet*  
*Weight: 5 ounces*

Earpieces on the OA-5's are fairly large at 2¾ inches and the neat pads are made from nylon covered foam. The single headband is about 1½ inches wide and it is heavily padded with a brown vinyl cover. The earpieces are made from a dark brown plastic and they are suspended by anodized aluminum Y-brackets which also permit a certain amount of movement in the lateral direction. Each one can be extended to provide adjustment.

##### *Test Results*

*Output at 1 volt: 107 dB SPL*  
*Maximum output: 120 dB SPL*  
*Distortion at 100 dB SPL: 0.30%*  
*Comfort rating: A,A,A,B.*

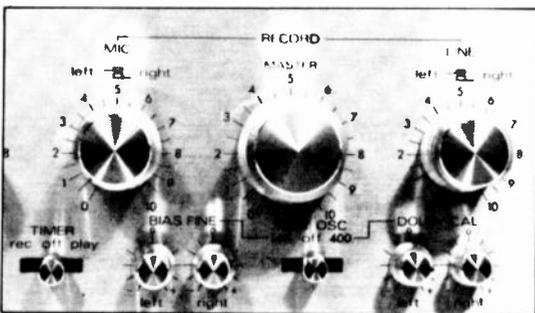
The frequency response showed a broad rise in the 2 kHz to 4 kHz band, followed by a smooth response up to 11 kHz where the output increased again,

## PHILIPS N5781 *Cassette Deck*

*At first glance, it doesn't look like much, but when it comes to performance and features the Philips N5781 has 'em all*

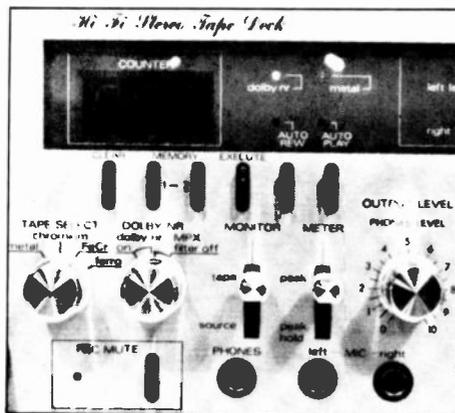
△ Although Philips was the originator of the Compact Cassette system, they never brought out a deck that was truly in the mainstream of high-performance design—at least that's the way it was in the U.S. Of course, one of the certainties of life is that when any major enterprise—which is also the originator of a system—decides—"to show them how the game is played," the result is usually just short of spectacular.

And that's the way it is with the new Philips N5781



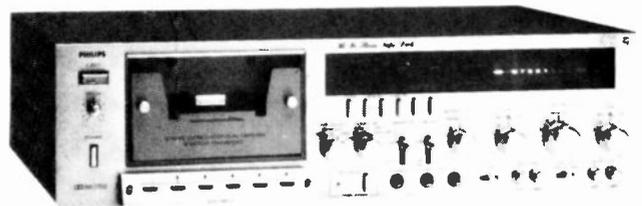
*The key performance feature of this cassette deck is its bias test system with a built-in 400 and 14,000 Hz oscillator. The complete biasing procedure takes no more than a few seconds.*

*Among the other controls are a microprocessor-controlled tape length counter with automatic start, play, rewind, and memory; fluorescent meter peak and peak hold meter; Dolby noise reduction/MPX filter; and tape type select.*



metal-capable cassette deck. Basically, the machine has the appearance and features of cassette decks that originate in the Far East, where the new Philips is manufactured. It is front loading with a dual capstan drive, has a three-head system for simultaneous record and playback and a dual-Dolby with selectable mpX filtering, includes microphone and line input mixing with a separate master gain control, and accommodates ferric, ferrichrome-bias, chrome-bias, and metal tapes.

Among the extra features are a bar-graph peak/peak-hold record level indicators, a calibration system for tape sensitivity and frequency response using two frequencies (the best system), an electronic counter with two memories that can provide automatic rewind and replay between two selected cues, and an RF interference (RFI) suppressor. The remainder of the features are more or less conventional and are listed in the test report elsewhere in this issue.



Circle No. 95 On Reader Service Card

The peak/peak-hold meters are similar to those found on other high-performance decks. In the *peak* mode the display rises almost instantly to the peak record level and then collapses on itself (telescopes) at a moderate rate, providing a display that essentially tracks the peaks at a rate comfortable for continuous viewing. In the *peak-hold* mode the meter rises to the peak signal level and maintains the "reading" until a higher signal is indicated or the meter is cleared by the user.

The two-tone sensitivity/bias calibration system has individual left and right controls for all adjustments and a fixed reference level of 0-dB. There is no source/tape matching required. The user simply sets the test switch at 400 (Hz) and adjusts the Dolby calibration (sensitivity) controls for a 0-dB meter indication while the tape is running in the record mode. Then the test switch is set for 14 kHz and the bias adjustments are again set for a 0-dB meter indication. Total time needed for a precise tape calibration is about 10-seconds. And the results are somewhat spectacular: the response for all four types of tape were among the "flatest" we have seen and heard. In fact, because the peak-hold metering virtually insures against tape overload, the "ultra-flat" response results in an exceptional playback sound quality. Using metal tape, which provides extended high-frequency 0-dB response, the sound quality of the recordings was as good as what we've heard from the better 3¼ ips reel-to-reel decks.

The electronic counter and memory system is cute, but doesn't quite realize its potential. The counter itself has three digits; though it appears to be timing it's not, it just provides reference numerals the same as a mechanical counter. There are two memories that are programmed by simply pressing the appropriate button. At the instant the button is pressed the memory stores the counter reading. Memory No. 1 is a "start" memory; memory No. 2 is an "end" memory. If the *execute* control button is depressed and the tape put into fast forward it will advance until the counter indicates the "start" reading and then play the tape. If memory No. 2 has been activated the tape will play to the No. 2 counter reading and then rewind. If the No. 2 memory has not been activated the tape will simply play through to the end and activate the auto-stop. If the auto-play and auto-rewind buttons are depressed without the *execute* active the auto-modes will simply ignore the counter and function between the beginning and end of the tape.

There are some minor irritations with the counter and memory system. Firstly, the counter cannot be reset while the tape is running; the tape must be stopped for reset. Second, the counter cannot be advanced by itself for memory programming; the user must run the tape to the desired location and enter whatever is indicated by the counter in memory. (Best bet is to always reset the counter at the beginning of the tape.) Finally, if the *execute* is on while

(Continued on page 71)

# TDK CREATES SA-X.

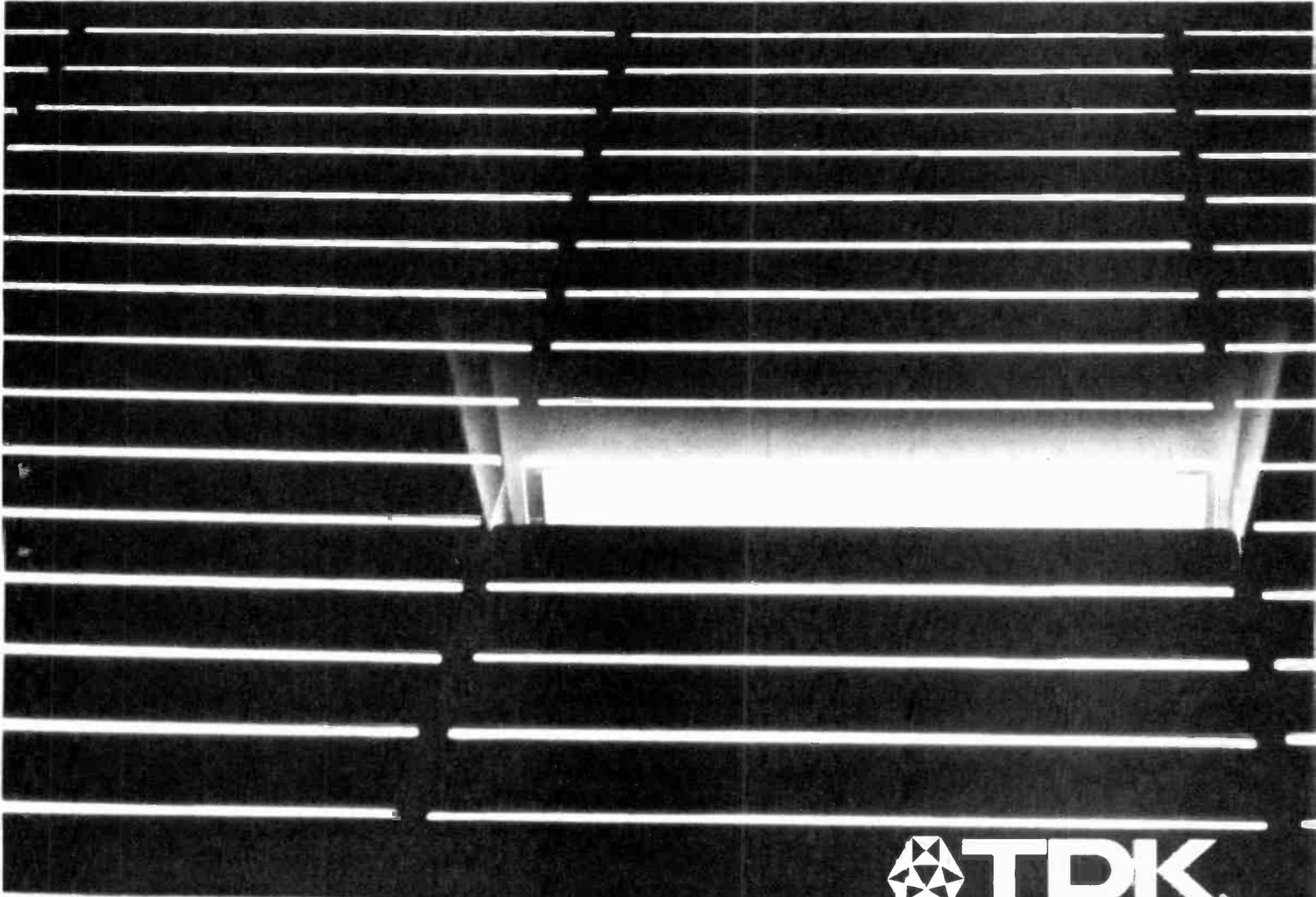
## Now you can explore the far reaches of high bias.

TDK has added a new dimension to high bias recording. It's called SA-X.

SA-X emerges from the Super Avilyn technology that has set the reference standard for high bias cassettes. Beyond that, TDK engineers saw new worlds of high bias to explore. By taking two layers of Super Avilyn with different coercivities and optimally matching them, TDK creates a formulation that raises high bias to a higher level. One that approaches the sound quality of metal.

You will hear rock and jazz soar to new heights. Classical, with more of its wide dynamic range. A clarity that even the best bias couldn't give you before. With every kind of music, SA-X brings you closer to the richness of a live performance. And it will keep you there, with its flawless mechanical construction. TDK has given SA-X the Laboratory Standard Mechanism for optimal interfacing with cassette deck heads. You'll hear its consistently superior performance for years to come.

SA-X performs like no other cassette. Expect it to cost a bit more. You can also expect it to take you further into high bias than you've ever been.



# Hi-Fi Accessories Guide

Record and tape care products for the hi-fi enthusiast—from \$1 to \$100

by Ken Irsay

△ Back in the early Fifties, an article devoted to audio accessories would deal primarily with the umpteen million brands of pink cloths with serrated edges, impregnated with some mysterious substance that claimed to clean your records. Later in that decade an exciting new product would capture the imagination of the music lover: little colored plastic discs that allowed you to play your 45's on your phonograph's regular long spindle.

Well, in case you haven't noticed, the world of home audio has grown substantially in the last 25 years. So has the world of audio accessories. There are many clever little devices with which you can upgrade your audio enjoyment without downgrading your bank balance. For

the purposes of this sampler, we've selected an arbitrary monetary limit of 100, although most of the items covered here fall well below that figure. We'd hardly call these products "stocking-stuffers" (they're far too useful for such a frivolous designation), but they do make ideal gifts for your family audiophile.

Be advised that the prices listed here are fairly close to what you'll actually pay at your dealer. Discounts on accessories tend to be slight or nonexistent when compared to the big breaks frequently available on components, especially in large competitive markets.

**Turntable Accessories.** By far the largest category of audio accessory relates to your turntable, and the largest sub-category



Scotch (3M) Record Care System (\$28)



Empire Scientific Disco Film (\$15)



Maxell Tape Recorder Care Kit (\$8.95)



B.I.C. Beam Box FM8 Antenna (\$50)



Discwasher Record Care System (\$16.50)



Bib Groove-Kleen (\$15)



Sound Guard Record Care Products

contains more record cleaning products than you could imagine. There are two basic types: 1) A manual brush with associated liquid, to be used before playing, and 2) An auxiliary arm with a brush at one end, which, when attached to your turntable, sweeps the record clean as it plays. We sampled many of these items and found the following to be the most effective:

● **Discwasher Record Care System**—This venerable pre-playing product is now in its fourth improved formulation. The company says the new D4 fluid is more active and offers enhanced micro-dust suspension, while the new D4 pad is softer and thus safer for long term use. (\$16.50)

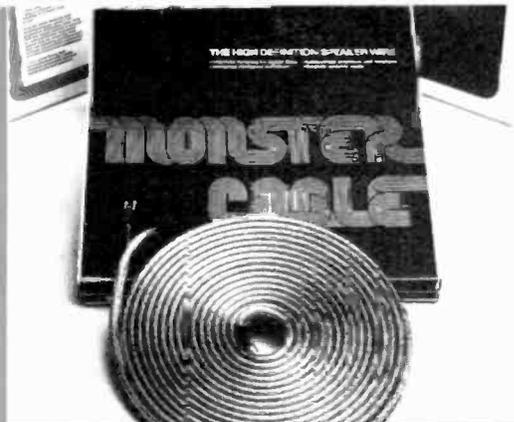
● **Audio-Technica Sonic Broom**—Like the preceding, this brush contains slanted fibers which get to the very bottom of your record grooves to dig out the most stubborn grime without harming the vinyl. Unlike the Disc-

washer, which requires manual application of fluid to the brush's surface before each use, the Sonic Broom handle contains a reservoir that holds enough fluid to humidify the brush for short term continued use. (\$12.95)

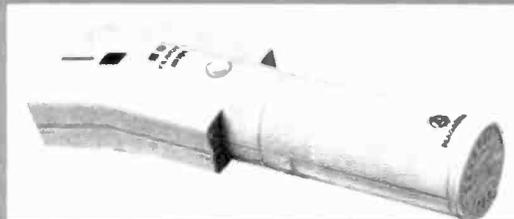
● **Recoton Clean Sound II**—The company claims that in addition to cleaning soil and fingerprints, this brush/fluid combo reduces measurable static from your records by 98 percent over untreated discs. The system is packed in a handsome smoked plastic storage box. (\$15)

● **Audio-Technica Autocleanica**—This auxiliary arm device combines a grounded carbon brush to loosen grit and drain away static charges with a reservoir-humidified plush pad to remove dirt and dissolve fingerprints. (\$12.95)

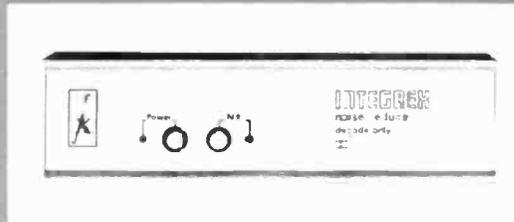
*Benjamin Lencomatic (\$19.95)*



*Monster Cable (\$25 and up)*



*Nagaoka (Osawa, Kilovolt) (\$50)*



*Integrex DFM add-on Dolby (\$200)*



*Pickering Stylus Care Kit (\$10.95)*



- **Bib Groov-Kleen**—Operating in a similar fashion, this clever device tracks across the record from a metal support held above the disc, like a parallel tracking tonearm. It thus exerts only the extra weight of the brush and pad on the record. (\$15)

- **Benjamin Lencomatic**—This is also a parallel tracking unit, but attaches to the underside of the dustcover rather than the corner of the unit plate. An anti-static carbon fiber brush works in conjunction with a foil platter mat to discharge static electricity from both record sides at once. A natural hair pad does the deep cleaning job. (\$19.95)

- **Decca Zero Ohms Record Brush**—More than one million (so they say) carbon fiber bristles operating in tandem with a zero ohms resistance finger disc provide static elimination and cleaning without fluid. (\$18.95)

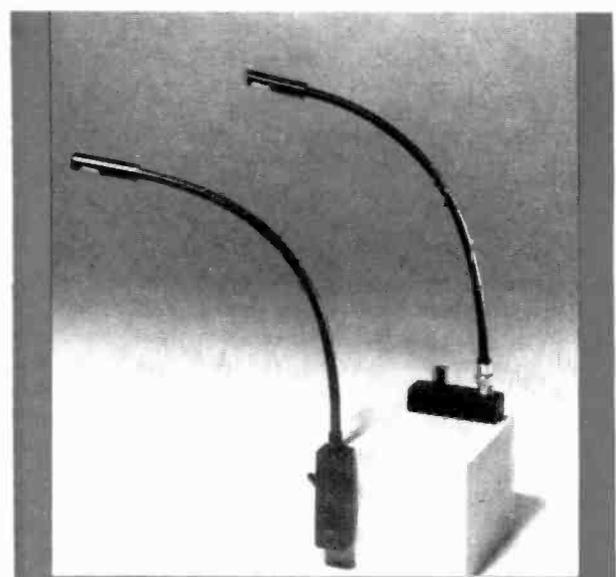
- **Robins Vac-O-Rec**—This machine actually vacuum cleans your records. When it first appeared several years ago, many audiophiles reacted with horror to the idea of sticking their prized discs into a mysterious slot and then turning on a motor. Heaven knows *what* was going on in there! Well, the

device has withstood the test of time. The motor slowly rotates the disc past a metalized mylar brush which discharges static electricity. Then soft mohair brushes dislodge the dirt from both sides and a vacuum cleaner swallows the stuff (Basic model, \$35; Decor-styled model with improved static removal and washable vacuum filter, \$50).

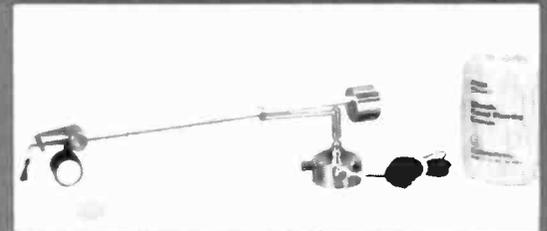
- **Empire Disco Film**—Another one-of-a-kind product, this substance is a water-soluble gel, which, after application to the record surface, dries and is then lifted off the record with all the dirt stuck to it. The company says one application keeps the disc clean for eight to 15 plays. Disco Film is part of Empire's extensive "Audio Groome" line of record care products. (\$15)

- **Scotch Record Care System**—The heart of this system is a "Sound Life" fluid claimed by Scotch to reduce stylus-groove friction, remove oil and impart lifetime anti-static properties to records. The fluid comes in an applicator bottle which applies a metered amount to a suede-

(Continued on page 66)



Custom Audio Fleet-on or Littlites (Frc.) \$35

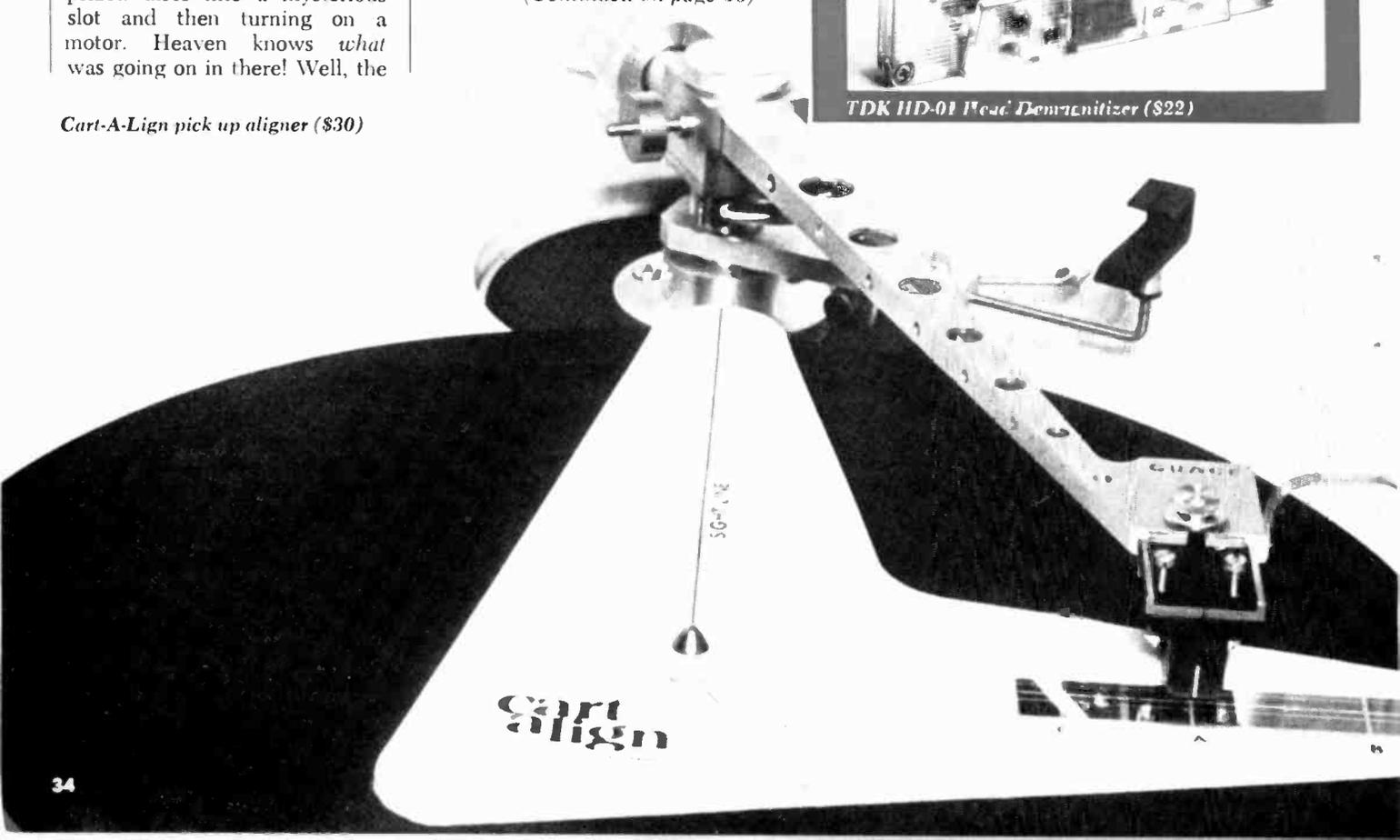


Audio-Technica Artisanica Disc Cleaner (\$12.95)

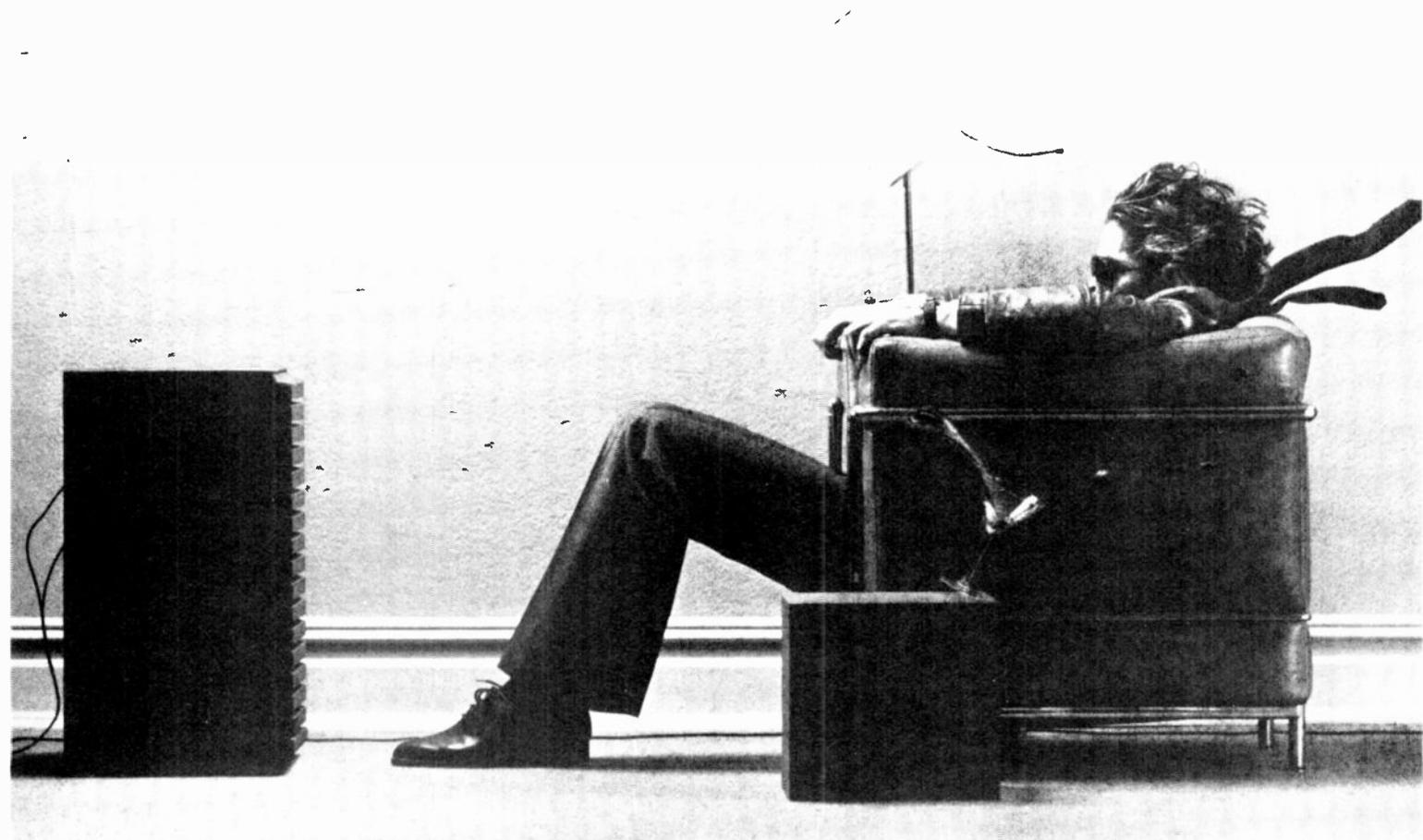


TDK HD-01 Head Demagnetizer (\$22)

Cart-A-Line pick up aligner (\$30)



# AFTER 500 PLAYS OUR HIGH FIDELITY TAPE STILL DELIVERS HIGH FIDELITY.



If your old favorites don't sound as good as they used to, the problem could be your recording tape.

Some tapes show their age more than others. And when a tape ages prematurely, the music on it does too.

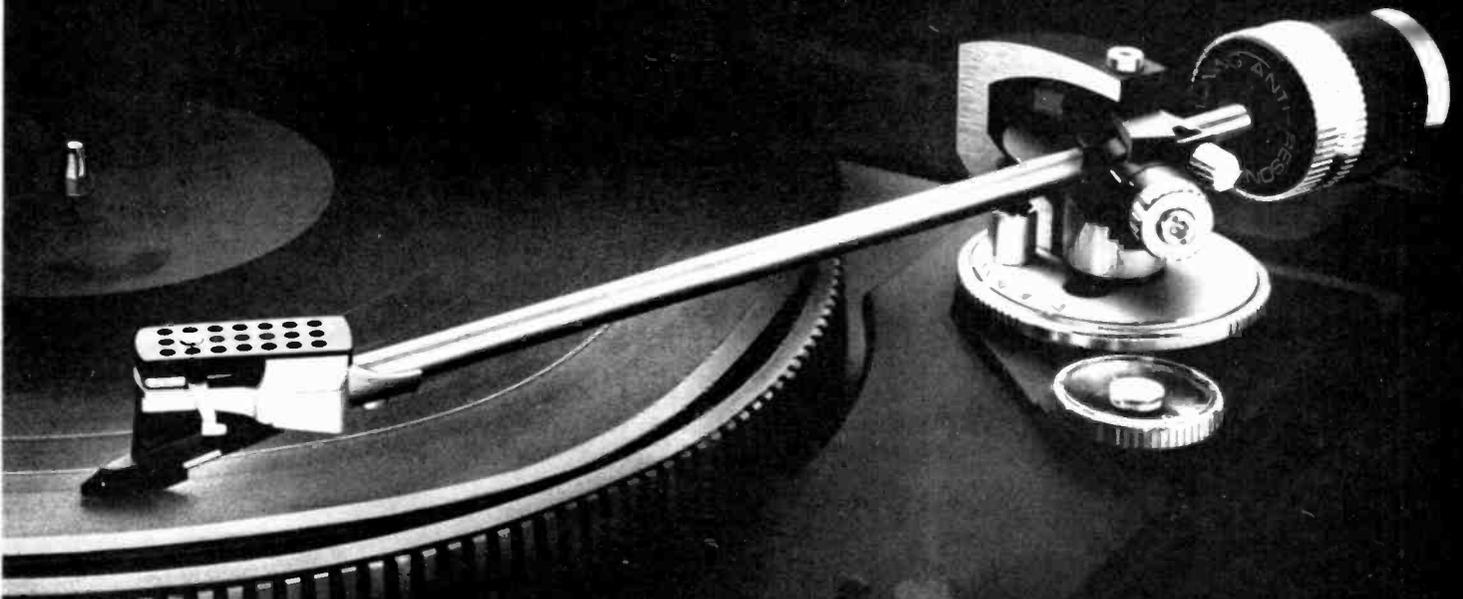
What can happen is, the oxide particles that are bound onto tape loosen and fall off, taking some of your music with them.

At Maxell, we've developed a binding process that helps to prevent this. When oxide particles are bound onto our tape, they stay put. And so does your music.

So even after a Maxell recording is 500 plays old, you'll swear it's not a play over five.

**maxell**  
IT'S WORTH IT.

Test labs now use  
an extraordinary new instrument to  
evaluate record playback performance.  
A warped record.



Magazine test reports are usually based on measurements made with professional equipment and under ideal laboratory conditions. None of which matches the real-life situation you face at home.

Virtually all records manufactured today are warped. And even records that are slightly warped can make conventional tonearm and cartridge combinations (typically 18 grams effective mass) distort badly and even leave the record groove.

The test labs know this, of course, which is why they tried something different with Dual's 8-gram Ultra Low Mass tonearm and cartridge system. They added an innovative test instrument to their scopes and meters.

A badly warped record.

The results of this new test are not reported as percentages, decibels or other technical jargon, but in clear and unmistakable language:

"Navigating the worst warps we could find, the Dual/Ortofon combination proved very agile indeed, with nary a mistrack."

*High Fidelity*

"...tracked the most severely warped records in our collection, usually so well that we heard nothing wrong." *Stereo Review*

"Even a severe warp that would normally throw the pickup into the

air will usually give no more than a slight 'thump'... and most warps are undetectable by ear."

*Popular Electronics*

"The Dual takes dead aim at the fiend of disc reproduction—the warped record—and response to record warps practically is eliminated at the source." *Stereo*

One test lab, after making the usual measurements, chose to just listen to music as reproduced by ULM.

"There is no way measurements, or mere words, can describe the acoustic presence of this record player... highs are crystalline, with a purity we haven't heard before. The bass is so clean that one can hear new sounds from records, such as the harmonic vibration of unplayed strings on the double bass... overall definition and transient response were outstanding."

*HiFi/Stereo Buyers' Guide*

You too can hear the difference ULM makes. Visit your local Dual dealer and be sure to bring your own "test instrument." Especially one that seem unplayably warped.

ULM.

A major breakthrough in record playback technology.

Write for our brochure describing all nine Dual ULM turntables. Prices start at less than \$190. United Audio, 120 So. Columbus Ave., Mt. Vernon, NY 10553.

Write Directly to Manufacturer for Literature.

Dual

# What's New For '81

The holiday season's new crop of innovative hi-fi components/By Fred Petras

△If you are shopping for hi-fi equipment this holiday season you'll find lots of exciting new products to choose from, and at prices seemingly immune to inflation. There will be many components available that use the latest in modern audio technology:

Receivers with digital synthesized tuning, digital station readouts, automatic scanning, station pre-sets, and DC amplifier circuitry.

Preamplifiers with moving coil inputs and selectable cartridge impedances.

Amplifiers with variable (rather than fixed) loudness controls and new circuits designed to eliminate various forms of distortion inherent in audio.

Tuners with digital synthesized tuning, auto-scanning, digital readouts, and station pre-sets.

Turntables with tangential tracking, or models with straight tonearms, and sophisticated cueing systems.

Cassette Decks with metal tape capability, fine-tune bias controls, Dolby HX (headroom extension), programmable memory systems, and automatic program search capability.

Speakers with new cone materials and other attributes that make them capable of reproducing the wide dynamics of direct-to-disc and digitally-recorded phono discs.

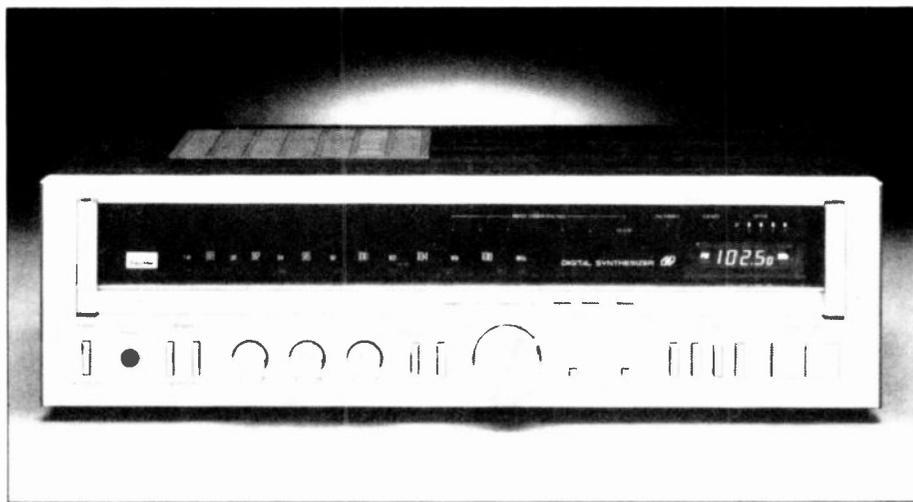
Micro Components, for top quality sound in a minimum of space.

Remote Control audio components.

One-band audio systems made up of components from a single manufacturer.

The foregoing are among the most obvious trends apparent in the new crop of hi-fi products that debuted at the recent Summer Consumer Electronics Show in Chicago sponsored by the Electronic Industries Association (EIA), and which are now showing up in your local audio stores' displays and soundrooms. (We'll refer to it as The Show in this article.)

Receivers. If "bells and whistles" are your bag, the 1981 crop of receivers is for you. They look space-age sophisticated, elegant, and quietly dramatic.



Sansui's new 3900Z receiver has digital synthesized memory tuning and a DC servo amp that delivers 40 wpm. \$390. For more info circle 51 on reader service card.



Changers are back, and BIC is after the market with models like this Micro 150X with low-mass tonearm and belt drive. Lists for \$99.95 with cartridge. Circle 62 for info.

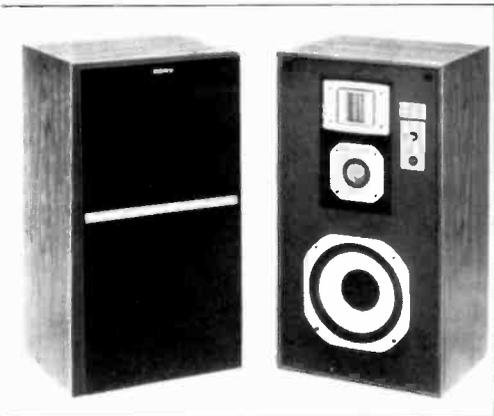
As noted, the big news is digital synthesized tuning, automatic scanning of station frequencies with digital readouts, and station pre-set capability—generally from five to eight FM and AM stations. Such models are notable for their lack of tuning knob—with tuning functions assigned to small push plates or pads. In addition to its convenience benefits, digital synthesized tuning offers the ultimate in tuning accuracy. Among companies offering such receivers were the following: Kenwood, Sony, Sansui, Rotel, Hitachi, Technics, Aiwa, Fisher, and JVC.

In terms of power, most of the new offerings are in the 40 to 80 watt per channel area—considered plenty of power for the average home in that more and more of today's speaker systems are of higher efficiency, needing less "drive" power.

The new receivers are also notable for a variety of readouts and mode indicators. These are generally in the form of LEDs in several colors. Also used are colorful fluorescent readouts, generally for peak power indication. Among the interesting indicators is a unique dial pointer assembly used by



Marantz's model 600 speaker has a great-looking simulated walnut grill cloth. This four-way unit costs \$599. Circle No. 115.



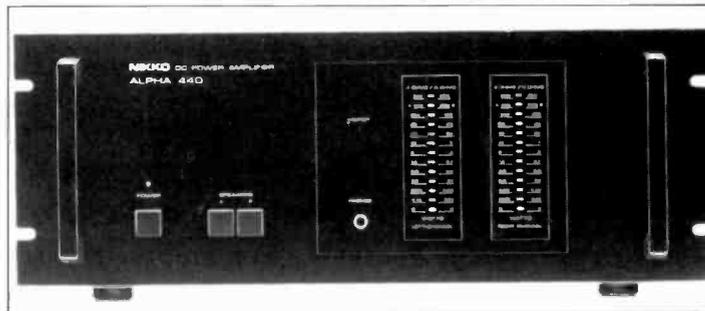
Speaker manufacturers are using more complex high-frequency drivers. Sony's SS-U60 has ribbon tweeter. \$180. Circle 117.

Kenwood in five of its new receivers, for utmost ease of tuning with optimum precision. When activated to a station frequency, either of two red LED arrows adjacent to the pointer turns on, to tell which direction to fine-tune the pointer. When the pointer is precisely centered, it glows red, and the two side arrows disappear. When the tuning knob is released, the pointer turns green—to show exact tuning and that the selected channel is locked in.

While many of the new receivers are fairly large, some are quite compact, featuring a "slim-line" profile. Among key examples are Denon's Model DRA-600, Hitachi Models SR-6010 and 5010, and Kenwood's KR-80.

Among notable receivers at The Show were: several JVC and Fisher units featuring built-in graphic equalization; the Mitsubishi DA-R20 and Fisher models RS270 and RS250 with built-in moving coil cartridge inputs; three models from Kenwood and two from Mitsubishi with switchable IF mode selectivity (narrow mode for improving reception in urban areas, wide position for improving it in rural areas); five Kenwood models with 'high speed' amplifiers, all DC types; receivers from

## What's New For '81



Nikko's Alpha 440 is a 220 wpc high-speed power amplifier with a non-switching output stage for "low distortion." \$950. Circle 86 for info.

Cassette decks appear to offer the most style variety of the components. Kenwood's crisp looking KX-400 is a \$189 machine for use with chrome and normal tape. Circle 93 for info.



Sansui that have 'feed-forward' circuitry; DC amplifiers from Technics, Mitsubishi, Toshiba, Rotel, Lux, Fisher; and Class G circuitry from Hitachi in a 25 watt-per-channel receiver priced at \$260.

Also of note were receivers from Kenwood featuring ASO—for Area of Safe Operation. It is a monitoring system that keeps tab on current, voltage and power dissipation, to protect speaker coils and power transistors.

**Preamplifiers.** Six major audio firms set what will eventually be a major trend in preamplifiers—MC (moving coil) inputs, selectable impedances.

ADC in its new Designer Series deluxe *cascode tube* preamp priced at \$1,195, offers one moving coil input, one 47,000 ohm magnetic phono input, and one magnetic phono input with adjustable impedance and capaci-

tance input. Onkyo's P-3060 has inputs for *three* different types of MC cartridges as well as moving magnet models. Denon Model PRA-2000 accepts a moving coil cartridge and two additional moving magnet or moving iron types. Two deluxe preamps in the new Marantz "Esotec" series, the SC-9 and SC-6, in addition to MC inputs, offer adjustable cartridge loading for moving magnet cartridges, and gold plated input and output jacks. Nikko's new Beta 20 has 47,000 ohm and 100,000 ohm input impedance selection for its MC input, while the Beta 40 has a two-input, five-position phono selector enabling the user to choose a moving coil or moving magnet cartridge at Phono 1 with switchable 22,000, 47,000 or 100,000 ohm input impedance, or Phono 2, with 47,000 ohm impedance. In addition to an MC

input, the new Phase Linear Series Two Model 3500 preamp features parametric bass, midrange and treble controls—unusual in preamps.

**Amplifiers.** The main thrust of several companies showing new amplifiers at The Show was reducing distortion to unprecedented low levels. Sansui, for example, developed a system called Linear A bias control, used in three new models. It eliminates switching

and crossover distortion that occurs as output transistors switch on and off. Linear A features a real time bias control to prevent transistor switching altogether, for the low distortion of Class A amps, the high efficiency of Class B types. Kenwood has a no-switching variable bias system appropriately called Zero Switching. JVC has an essentially similar system which it calls Super A. In Technics New Class A cir-

cuitry, the output transistor bias current is synchronized with the positive and negative swings of the in/out signal so that the output transistors are always in an active state. By using this circuitry, switching distortion is eliminated since the transistors are never allowed to switch off. Technics calls this synchronized operation "Synchrobias."

Lux, with its new Duo Beta circuitry is out to eliminate THD—total harmonic



Pioneer's digital timer (DT-500) enables the user to set components to turn on at specific times or to be switched off in (sleep switch) two hours. \$119. Circle 148.

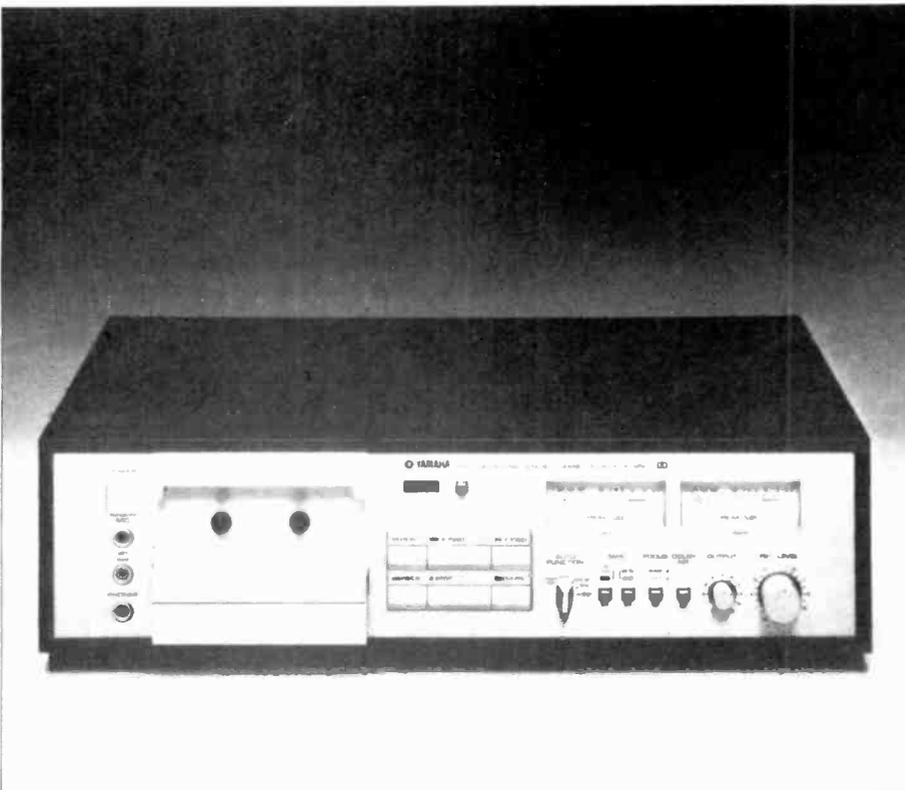
ADC's MS650 mini speakers feature a unique truncated pyramid design with two drivers. The 11-inch tall unit can handle up to 150 wpc. \$145 each. Circle 118 for info.

distortion. Duo Beta is the application of two separate negative feedback loops, each precisely oriented for a specific circuit path, with each section getting the optimum amount of feedback, knocking out distortion.

Sansui uses a proprietary circuit named Super Feedforward, a technique that automatically cancels the distortion that remains after the application of optimal amounts of negative feedback. It takes over at the point where negative feedback begins to fail as a solution for distortion prevention.

Like the new crop of receivers, the new crop of amplifiers features a variety of readouts, largely performed by colored LEDs. The main readout is, of course, peak power level, but the devices also provide indications for various operating (mode) functions. But power output meters are far from dead. Marantz, for one, uses them in its new deluxe Esotec series, in the SM-6 basic stereo amp at \$850, and in the super deluxe SM-1000 at \$5,500 (the latter is the "reference standard" for the Japanese broadcasting industry).

A check of The Show's amplifier offerings revealed moving coil inputs in the following integrated amplifiers: JVC AX-4 and AX-3; Sony TA-F35, TA-F45 and TA-F55; Sanyo Plus A 75, Denon PMA-550, and Rotel RC-1010. Variable loudness control for greater control of low-level listening bass response was found in the Yamaha A-550, JVC A-X3, and Sanyo Plus A 75. Some form of equalization or equalizer-type tone control was offered in Philips AH-280, Technics SU-V8, and JVC models A-X4 and A-X2.



Yamaha's K-850 is designed to "close the (dynamic range and frequency response) gap between tape and disc," by taking advantage of the performance of metal tape. \$360. No. 94.

## What's New For '81

And more "fast" models with high slew rates for better transient response and lower distortion were seen. Sansui heads the slow-rate "race" with its Model AU-D11, boasting a 400V/ $\mu$ Sec slew rate. Two other Sansui models are spec'd at 220V/ $\mu$ Sec, and a third at 200V/ $\mu$ Sec.

Tuners. The most obvious aspect of the new tuners bowing at The Show was their slender profiles. Perhaps the

Sony's Acute Servo Lock system featured on a number of their tuners.

Turntables. "The Word" in turntables is straight tonearms (preferably of carbon fiber), front-mounted controls, and anti-resonant bases. Beyond the above there was little in the way of new developments at The Show. But there were a few goodies—like models in the JVC, Hitachi and Sony lines that feature a photosensor end-of-play detection system to lift the tonearm immediately once it enters the cut-off groove. And a programmable model in the Sansui line that can be programmed to play up to seven selections on a record side in any desired order.



narrowest of the lot was Technics' Model ST-S7, a mere 2 3/32 inches high. (The unit also functions as a programmable timer and digital clock.)

Only slightly less obvious was the stress on digital quartz synthesized tuning, automatic scanning, digital readouts, and station pre-sets. Among such models were Sansui TU-S9 and TU-S7, Hitachi FT4400, Rotel RT-1010, Philips AH180, Nikko Gamma 20, and Technics Models ST-S7, ST-S3, and ST-C03, the latter a micro model about 11 inches wide.

The third trend in tuners was the appearance of many more models with some sort of tuning-lock system to enable users to optimally tune in desired stations and hold them in that position. One of the most notable of these is

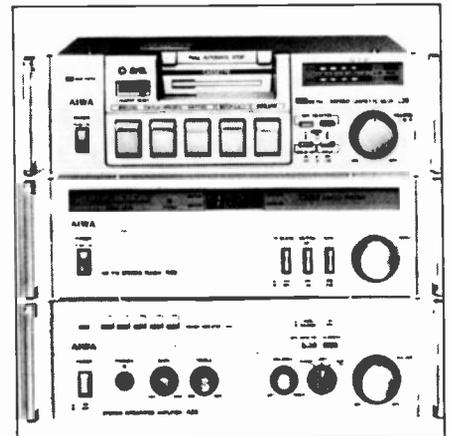
Among the more intriguing models in terms of dramatic, space-era appearance was a belt-driven manual turntable from KM Laboratories of Belgium. Its Audio Linear model with 24-pole motor features a 6.2 pound platter with six support modules on its surface. The base is of 15mm thick plexiglas. An optional smoked-glass platter is available at \$50.

Without a doubt the ultimate turntable shown at The Show was Thorens' new "Reference Turntable," priced at a whopping \$15,000. It features a 14½ pound platter, adjustable gold-plated suspension housings, three speeds, and three-arm mounting capability.

Suggesting an on-coming trend was the debut of three radial-drive turntables featuring tangential or linear

tracking. One, from Mitsubishi, Model LT-5V, offers an additional advantage; it is operated in the *vertical* position. This can be a real space-saver under some circumstances. And in all circumstances it means your records won't accumulate dust during playback. Another model from Mitsubishi and one from Yamaha operate in the traditional position. The basic claim for these machines is that they emulate the tracking of cutting arms used in *recording* records. And can better handle record warps than traditional turntables.

Cassette Decks. More was the essential thrust of this category. More metal-tape-capable models, some new, some



Micro-components, after a slow start, are beginning to gain increased consumer acceptance. Aiwa's M-302 system is less than 10 inches high. \$600. Circle 139 for info.

A low-priced (\$299.95) remote control turntable with record changer was introduced by BSR. For more information about the Pro 300's many features, circle No. 63.

updates of existing decks; more with remote controls; more with automatic search capabilities; more with fluorescent or LED readouts; more two-speed models; more automatic-reversing models; and more with programmable memory systems. And more metal-capable models priced under \$200.

The proliferation of new tape formulations, including metal, and a greater awareness of the importance of accurate biasing, has caused manufacturers to include this feature in more of their cassette decks. Among companies offering new decks with variable "fine-tune" bias controls were Kenwood and Rotel with two models each, Harman Kardon with four, Onkyo with three, plus Philips, Aiwa, Nikko and Sony, all with one model each.

In terms of nuances that hint at a new trend was the appearance of digital readouts of tape in place of the traditional small-figure tape counters. Such readouts were found in the Philips N5788, Sharp RT-20, and the Mitsubishi DT-40.

Also hinting at a trend was the appearance of the AEG-Telefunken High-Com noise reduction system in new form—as a built-in in Saba Model CD-362, which also features Dolby-B noise reduction.

While two decks may not add up to a trend, we'll go on board to predict that the new Fisher CR-M500 and Olympus Pearlorder MD-1 are the

tem, HX, that achieves an increase in recording headroom of as much as 10 dB at high audio frequencies. Such models appeared in the Eumig, Harman-Kardon, Onkyo, Lux, Blaupunkt, Cybernet, NAD, Teac and Fisher lines.

Reel-to-Reel. The growth and development of the cassette into a superb hi-fi reproduction medium notwithstanding, the open-reel tape recorder category showed signs that it is *not* stagnating, as many believe.

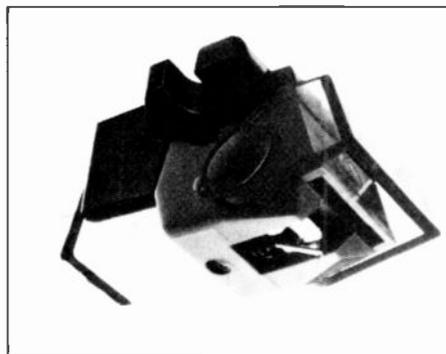
Akai added the GX-625, a 10½-inch, three-head unit with digital timer display, at a moderate price of \$750—a price level that has been virtually nonexistent for several years.

version of the 1350.

Tandberg, in trying to offset the high cost of digital type recording equipment, came up with an experimental version of its open reel TD-20A, expected to sell for about \$2,000. It features a 10-microsecond playback equalization curve, plus Dvneq dynamic equalization, to extend the dynamic range and high frequency response by some 12 dB, with a signal-noise ratio of 80 dB. In the interim, current owners of TD-20As, can modify them to match the experimental prototype at a cost of \$350.

Speakers. With some 400 companies producing speaker systems, it was only

As usual the tape manufacturers were out in force with new formulations and new packages. Sony took the opportunity to introduce 60- and 90-minute metal tape. Circle 145.



A big trend in the industry is towards portable stereo with headphones. Technidyne's Hip Pocket Stereo is one of a number of such units. \$184. Circle 147.

Audio-Technica U.S. introduced a number of new cartridges including this medium price (\$65) AT110E with dual moving-magnet. Circle 150 for more information.

Right JVC uses a microcomputer and servo motors to control vertical and horizontal tonearm movement on its QL-Y3F turntable. \$360. Circle number 64 for info.

harbingers of many more home tape machines using *micro-cassettes*. With the advent of metal tapes, Angrom (from Panasonic), and other high-density formulations, plus Dolby HX, and High-Com, micro-cassettes operating at 15/16 ips are on the way to becoming a hi-fi reality.

Among the most important developments at The Show was the debut of a dozen new cassette decks featuring Dolby's new headroom extension sys-

TEAC added the Model X-3 at a price of \$550. The seven-inch reel model is a two-speed unit with three motors and three heads, described as "an affordable alternative" to cassette decks for buffs wanting open reel quality.

Denon entered the reel market with the Model 1350, a half-track unit operating at 7½ and 15 ips. It is the first of a series of decks to be marketed by Denon, among them a quarter-inch

natural for this to be a "hot" category at The Show.

Part of the news was the entry of three European firms into the U.S. speaker market. One was S.I.A.R.E. Loudspeaker Corp., a French firm whose line of seven models priced from \$270 to \$690 stress "articulation . . . a distinction of the French temperament," via "an open, superbly clean yet smooth mid-range quality," and

(Continued on page 70)

## dbx 224 Type II Noise Reduction System

*A black box that no self-respecting audiophile should be without.*

△ Why do a listening test of a noise reduction system? Surely the differences between competitive models must be so small that only a well equipped laboratory can measure them. Right? I say . . . wrong! Sure, hardware has gotten sophisticated in recent years but there is still no instrument as fine as the human ear for detecting musical quality.

The purpose of this listening test is to confront one very good noise reduction (NR) system with a typical, good home audio set-up. What's more, I took things another step down the ladder of rigorous testing: live recording of exceedingly trying heaps of decibels in a concert situation.

With good reason, all previous column's have concentrated on just the component being tested. This eminently fair one-to-one meeting of the test unit and my own private audio Inquisition works well. It finds the strong points of a given design and isolates any weaknesses it shows with use. All well and good, but in the case of NR, it would be unfair to dbx and to its equally prominent competitors to write totally in a vacuum.

With this in mind, I approach the dbx 224 after having used or carefully researched Dolby B, Nakamichi-Telefunken Hi Com II, Sanyo Super-D, and—in a slightly different vein—Dolby HX. Of course there are others, often with excellent capability, but the need for simplicity imposed a limit on the number of comparisons we can look at here. Keep in mind, as you read this "road test" of the 224

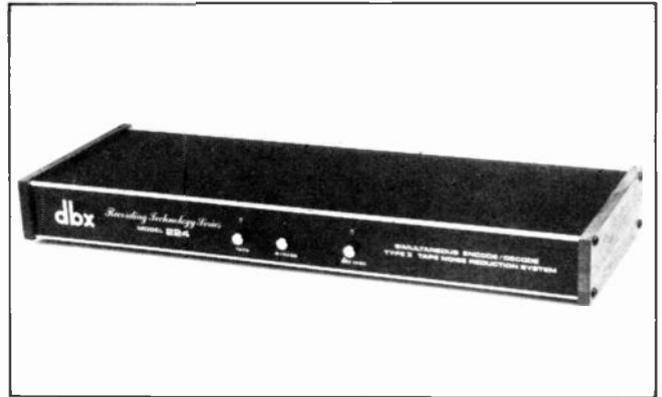
### DBX DISCS

• There has been a dramatic increase in the number and variety of dbx encoded discs available, a trend that seems likely to continue. Though there are a number of purely audiophile recordings, with marginal musical worth, there are some very worthwhile and musically exciting records in the growing catalogue of dbx discs. Some of these recordings are available *only* in dbx encoded format. •

The following record labels were producing dbx discs as we went to press:

- Chalfont (classics and light classics, film music)
- Crystal Clear (classics and light classics, jazz, pops)
- Concord Jazz (jazz)
- Desmar (classical)
- Desto (classical)
- Direct-Disk Labs (rock, popular)
- DW Labs (hispanic folk)
- Everest (light classics)
- Klavier (classical)
- Mark Levinson Recording Technology Showcase (classical, jazz, light orchestral)
- Miller & Kreisel Realtime (classical)
- Midsong (pops)
- Mushroom (popular vocals)
- Musical Heritage Society (MHS) (Classical) Mail-order only\*
- Nautilus (folk)
- Orion (classical)
- Sine Qua Non (classical, military band)
- Unicorn (Classical)
- Varèse Sarabande (classical, film, light classics)
- Vox-Candide (classical)
- Vox-Turnabout (classical, Gershwin)

\*MHS, 14 Park Rd., Tinton Falls, NJ 07724



Circle No. 149 On Reader Service Card

through, that each system has its particular application and targeted market.

In the 1970's, dbx marketed a professional NR line, the Type I. The models in this series were generally unavailable to consumers but they did create stirs in all the trade journals and even in general interest publications. This system encoded and decoded in a way rather similar to the one we review here, the Type II, but it's incompatible with its successor.

How does dbx work? Imagine a coil spring, a spiral of resilient tensed wire. If I apply enough force to compress it to half its length, I can fit it inside a box that would never contain the whole uncompressed spring. It can remain in the box indefinitely, but it retains a "memory" of its original form, to which it returns when I release it. For all intents, it is exactly the same as before it was so uncomfortably snugged into the box.

In dbx encoding, an audio signal possessing full dynamic range is converted into a signal that appears to occupy half the original range on a level meter. Very precise sensing of amplitude, transient characteristics, and other traits of the original insure precise translation into the half-size format. An original musical dynamic range of around 100 dB winds up being a mere 50 dB. With very minor departures, for reasons of tape and disc information overload characteristics, this compression occurs uniformly across the frequency spectrum, from 20 Hz to 20 kHz. Music with lesser or greater dynamic range occupies different amounts of dynamic room.

Great, but where's the noise reduction? In theory, this is a very simple and, to my thinking, ingenious solution to the problem of keeping the desired signal's quietest components comfortably above such sonic garbage as tape hiss, noisy record surfaces, and the odd amplifier noise. Assuming a clean master signal, the only thing stored in encoded form is music. On the dbx system —42.5 dB is the level of the quietest encoded signal and this is above the —45 dB disc surface noise level. (Disappointed purchasers of mass-marketed substandard pressings often bemoan much higher noise levels, while listeners familiar with good audiophile surfaces in their libraries have experienced surface noise down in the —50s . . . —45 dB is dbx's average for the discs *they* are concerned with.) Retranslated (expanded) back into normal dynamic relationships, the components of the encoded signal blossom back into the full range . . . with the noise well below the quietest music level.

Since the peaks have been halved relative to the center

(Continued on page 68)

# Now you can hear how good a Revox system really is.

Studer Revox is known for recorders. The best in the business. But since even the finest recorder is limited by what it is connected to, we recently developed a line of tuners, turntables and amplifiers to optimize the signals going to and coming from our tape machines.

Now the system is complete. We have a new speaker factory. We make our own drivers. And we're introducing three innovative, high performance speaker systems so you can finally have a system that is *all* Revox. With unmatched sonic quality and a special pride of ownership.

The **Revox Triton** has the uncommon ability to reproduce undistorted bass frequencies as low as 30 Hz, yet it fits almost unnoticed in rooms of any size or decor.

Triton is a three-piece system. Frequencies from 200 to 25,000 Hz are reproduced by two 3-way compact bookshelf speakers that can be easily placed for maximum stereo effect. And the lowest frequencies, which are essentially non-directional, are reproduced by a pair of subwoofers mounted in a single cabinet that may be placed anywhere in the room. The subwoofers are spring-mounted within the cabinet and their resonance is so low that no vibration is transferred to the cabinet. It can be used as a shelf for other components, even a sensitive turntable.

We are also proud of the new **Revox BR530** speaker system. It's a 3-way bass reflex system with the accuracy and musicality customarily expected from much less efficient units. The mid- and high frequency drivers are placed to eliminate interference beats, and ringing is eliminated by a specially damped phase modulator tube. The cabinet on this and all Revox speakers is as beautiful as the sound, with magnificent hand rubbed and oiled walnut veneers.

Our new **Revox BX350** makes use of the latest research in phase-coherent wave propagation. The cabinet is precisely stepped, to ensure that all frequencies reach the listener at the same time—even if they are coming from drivers with different depths. The five drivers are specially made with cast aluminum chassis and a new kind of cone treatment, and are arrayed for optimum dispersion and overall transparent sound.

Three superb, but different, new speakers. Hear how good they are at your Revox dealer.

## STUDER REVOX

Studer Revox America, Inc.  
1425 Elm Hill Pike,

Nashville, TN 37210, (615) 254-5651

Offices: LA (213) 780-4234; NY (212) 255-4462



Circle No. 35 On Reader Service Card



**GREAT CAR STEREO  
EXIT HERE**



A highlight of Grundig's GCM 9200 AM/FM stereo cassette combo is a three-band graphic equalizer. The set also has metal tape playback capability, auto-reverse, Dolby noise reduction, and automatic stereo sensitivity switching. Price, \$390. Circle 103.

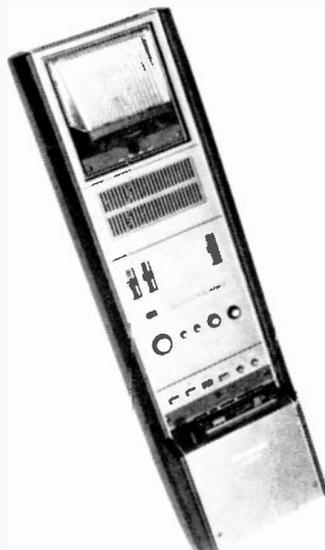


Meant for under-dash or in-dash use in compact cars is Sanyo's new FT150 cassette player, priced at \$139.95. Featured are auto-reverse as well as manual reverse, AMSS (Automatic Music Select System), Dolby noise reduction and locking fast-forward and rewind. Circle 104 for more details.



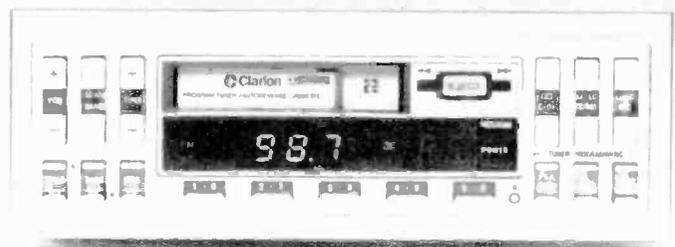
High frequency sounds are projected toward the middle and front of the car by Pioneer's new TS-1600 6½-inch rear-deck-mounted speaker featuring a 2¼-inch standing slant cone tweeter. High frequency dispersion is helped by a "diffuser." \$170 per pair. Please circle number 124 on the Reader Service Card.

Panasonic likens a car interior to an airplane interior; hence Cockpit Model RM-310, priced at \$600. This ceiling-mounted high power modular control unit contains FM/AM stereo radio with repeat-rack cassette deck, 10 wpc power amp, preamp featuring three-band equalization, and a dome light. Circle 126 for more details.

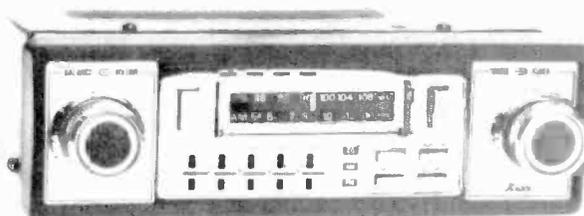


Able to fit "virtually any car on the road today, including X-body models," is Mitsubishi's RX-723 priced at \$150. The super-compact radio/cassette features auto-stop and a pinch-off mechanism that protects the pinch roller. A special nosepiece and faceplate permits both horizontal and vertical installation. Please circle number 137.

**MORE CAR STEREO** 



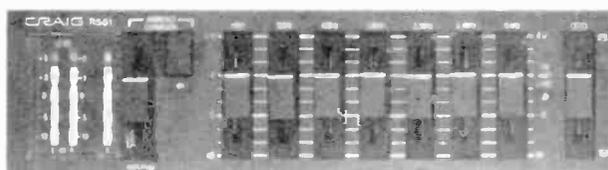
"The world's first programmable car radio" is how Clarion touts its new PE-959A, luxury priced at \$900. Its microprocessor allows you to program the set to automatically tune in 10 stations to start playing at whatever times you want. Other features: electronic scanning; metal tape equalization; digital readouts. Circle 127.



A weather band is a luxury extra in Krago's new KGE-801 AM/FM radio/cassette priced at \$200. Other highlights are five-band equalizer, local/distance switch, locking fast-forward, and in-dash or under-dash installation. Also available as a radio/8-track cartridge model at the same price. Please circle number 102 on the Reader Service Card.



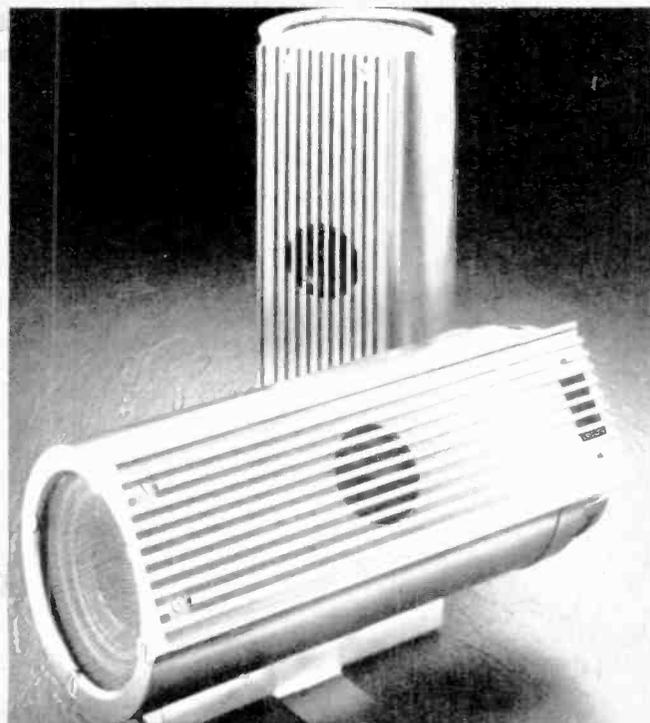
You can pre-set five stations on Fujitsu Ten's new Model GP-1010S1 AM/FM stereo cassette player with 5 wpc power output. Other features: FM muting; local/distance and stereo/mono switches; fader control. Price, about \$190. Circle 128 for more details.



New Model R551 from Craig is the first to combine seven-bands of equalization, electronic crossover for four channel, blamp and triamp systems, time delay, and speaker efficiency balancing functions in a single unit. Featured is a dual five-segment LED output indicator. \$149.95. Circle number 136.

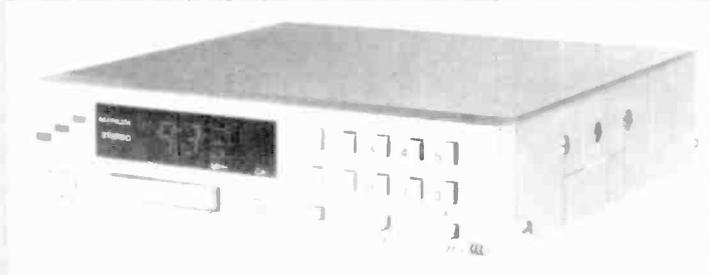


Midland's new Model 67-434 auto-stop radio/cassette player starts automatically when a cassette is inserted. It features local/distance switch, locking fast-forward/eject button, and 4.8 watts per channel RMS power. Price, \$79.95. Circle number 125 for more details.

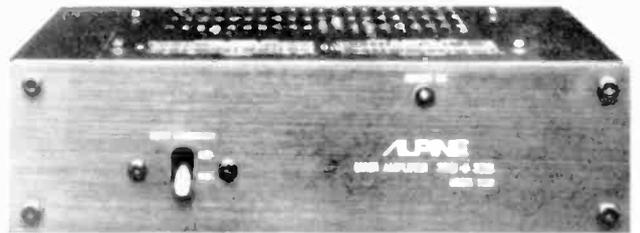


Right. Revolutionary is the word for Jensen's new J2000 car speaker system measuring 10½ inches long and 5½ inches in diameter. It houses a 4½-inch woofer at one end, a passive radiator at the other. Between is a dome tweeter. Swivel mounts allow rotation of plus or minus 30 degrees. Price, \$200. Circle number 135 on the Reader Service Card.

# INTERSTATE AUDIO DEVICES



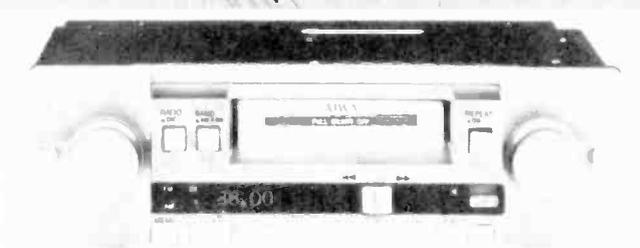
Sony's XT-1 FM-only car stereo tuner utilizes quartz-locked phase-lock-loop synthesized tuning with digital readout. It offers 10-station pre-sets, auto-seek and auto-scanning, direct access frequency selection, and an electronic manual mode to instantly select an FM station. Price: \$330. Circle 130 for more details.



Alpine's Model 3008 car audio amp offers 30 wpc RMS into 4 ohms, from 30 to 30,000 Hz, with no more than 0.2 percent THD. It has a pulse regulated power supply, auto remote power on switch, two inputs for both preamp and speaker, and input sensitivity control. Price, \$150. Circle No. 131.



Meant for X-body cars and imports with limited dash space is Kenwood's new KRC-411, priced at \$339. It features exclusive Automatic Noise Reduction Circuit, high-blend (to reduce background noise), 10-station pre-set memory, PLL synthesizer tuning with digital display and quartz clock, and auto-reverse. No. 134.



A PLL synthesizer, four-digit LED station indicator, 12-station pre-set tuning, metal tape capability, plus automatic reversing are the main features of Alwa's new CTR-3030Y AM/FM stereo cassette combination. It sells for \$300. Circle 132.



Here is J.I.L.'s "Concept" Model CD 82F, featuring normal-bias and metal tape playback capability. The auto-reverse unit also has a line output pre-amplifier and a stereo high-blend control. The set will work with a variety of equalizers and boosters for sound system selection flexibility. \$299.95. Circle 133 for more details.



Right, Audiovox's "In-Dasher" AM/FM stereo cassette player ID-605A has adaptors for use in GM's "X" body cars, including the Chevy Citation vertical mount, as well as many foreign cars. The cassette mechanism is an end-loader. Price, \$158. Circle No. 129.

# AUTO MODULES



## In-Dash Component Systems.

A component system in disguise.

If you've always wanted component sound, Mitsubishi has the answer. Our new Auto Modules have all the advantages of component separates, yet feature all the conveniences of an in-dash system.

The CZ-747 with its super-compact chassis, contains the in-dash module tape transport and tuning sections. It features a Sendust head, metal tape switch and an electronic tuning system with memory, scan and auto-search. Time-of-day and tuning frequency are digitally displayed and both tape and FM feature Dolby® Noise Reduction.

There's also the CZ-692. It features five AM or five FM pushbutton tuning, Sendust head and metal tape

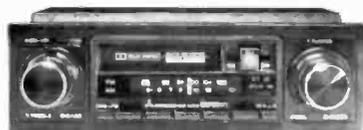
equalization. It too has Dolby® Noise Reduction on tape and FM sections.

Add one of the Mitsubishi Power Modules to suit your power requirements. Our Power Modules are available in 16, 50 or 100 watts of total power.

We also offer an optional 5-band Graphic Equalizer Module for complete sound contour control.

The Mitsubishi Auto Modules. A total concept in component stereo for the road. You owe yourself a visit to your nearest Mitsubishi Car Audio dealer.

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# TEST REPORTS



▲ The equipment reviewed on the following pages has been thoroughly evaluated by our independent electronics testing laboratory. Each piece of equipment is a standard production line model loaned to us by the manufacturer. We do not test prototypes or anything that looks like a "ringer." Since many of our performance tests are more stringent than those specified by the Federal Trade Commission (FTC) our specifications are not directly comparable to those found on manu-

**49 RECEIVERS**

**51 TUNERS**

**54 AMPLIFIERS**

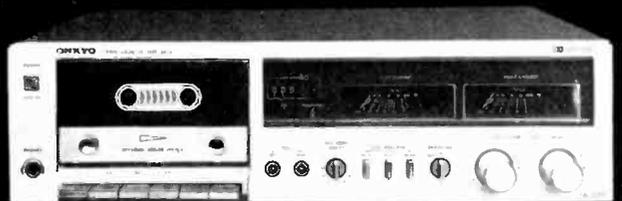


*ADC Astrion Phono Cartridge—see page 61*

**56 TURNTABLES**

**61 CARTRIDGES**

**63 CASSETTE DECKS**



*Onkyo TA-2020 Cassette Deck—see page 63*

facturer's spec sheets or to reports in other magazines. At the bottom of many of the reports are explanations of our testing procedures that will help you understand how to relate our test results to those claimed by the manufacturers. Also on the following pages are explanations of audio terms that will help you get more out of these reports. ▲

*Sony ST-J88B Tuner—see page 51*

**65 REEL TO REEL**



# RECEIVERS

## JVC R-S33 27-WATT AM/FM RECEIVER \$329

Circle No. 54 On Reader Service Card



The JVC R-S33 is an AM/FM stereo receiver FTC rated for 8 ohms at 27 watts RMS per channel, 20 to 20,000 Hz, at 0.03% THD. One of the primary features is JVC's SEA Graphic Equalizer, which provides  $\pm 12$  dB equalization at five center frequencies: 10, 250, 1,000, 5,000, and 15,000 Hz. The SEA can also be programmed to equalize the signal to the tape recorders. One of two tape inputs is a "selected input;" it could just as easily be called an auxiliary input. The switching arrangement for this tape, however, permits automatic dubbing to the second recorder. LED indicators are used for a stereo beacon, left and right output power indicators, FM center channel tuning, and AM

FM signal strength (AM tuning). The output power indicators have eight steps calibrated for 0.03 to 40 watts into 8 ohms. The output power required to illuminate any step was within  $\pm 10\%$  of the indicated value. The frequency response of the indicators was visually flat from 20 to 20,000 Hz. The FM center channel indicator is what has become a more-or-less standard three-position indicator: a green LED flanked by red LEDs, with center of channel. Except for the tuning knob, all controls are the linear (slider) type. An output hold-off prevents power supply turn-on transients from being fed to the speakers.

### INPUTS

- Magnetic phono
- Two tape
- 300 ohm FM antenna
- 75 ohm FM antenna
- AM rod antenna
- AM external antenna

### OUTPUTS

- Two speaker systems
- Two tape
- Headphones
- AC receptacle

### CONTROLS

- Volume
- Balance
- Five SEA equalizers

### SWITCHES

- Power
- AM
- FM
- Phono
- Tape No. 2
- Tape monitor (Tape No. 1)
- Loudness compensation

- SEA to recorders
- FM mono (FM muting off)
- High filter
- Speaker No. 1
- Speaker No. 2

### DIMENSIONS

- Width: 17.1 inches
- Height: 4.7 inches
- Depth: 13.6 inches
- Weight: 17.8 pounds

### FM TUNER PERFORMANCE

Input level for full limiting	4.5 $\mu$ V
Mono hi-fi sensitivity (60 dB quieting)	20 $\mu$ V
Stereo hi-fi sensitivity (55 dB quieting)	45 $\mu$ V
FM mute release response	13 $\mu$ V
Stereo frequency response range	30 to 15,000 Hz
Stereo frequency response limits	+0/-1 dB
Mono distortion at standard test level	0.2% THD
Stereo distortion at standard test level	0.3% THD
Signal to noise ratio at standard test level	66 dB
Midband stereo separation	38 dB
Alternate channel rejection (selectivity)	very good

### AM TUNER PERFORMANCE

Average

### AMPLIFIER PERFORMANCE

With both channels driven to the clipping level into an 8-ohm load from 20 to 20,000 Hertz:

Power output	30 watts RMS
Frequency response at 30 watts RMS	+0/-0.3 dB
Total harmonic distortion at 30 watts RMS	0.008%
SEA equalizer range at center frequency	$\pm 12$ dB for all controls
Hum and noise—magnetic input (3 Mv in, 10 watts out)	71 dB
Stereo separation—magnetic input	58 dB
Power meter accuracy at calibrations	$\pm 10\%$
Power meter frequency response	flat 20 to 20,000 Hz



### PRICES

All prices listed in the test reports section, as well as prices listed elsewhere in this issue, are approximate and subject to change. Use them only as a ballpark guide to what you can expect to pay for a piece of equipment. It is assumed that prices vary at the discretion of individual dealers and that advertised prices may change without notice. Fair trade laws allow the dealer to set the price; usually less than the nationally advertised value. In many cases the price is rounded off to the nearest dollar.

# RECEIVERS



## NAD 7020 20+ WATT AM/FM RECEIVER \$330

Circle No. 52 On Reader Service Card

The NAD 7020 is an AM FM stereo receiver: FTC rated for 8 ohms at 20 watts RMS per channel, 20 to 20 kHz, at no more than 0.02 percent THD. The actual output power measured some 50 percent greater than specified, and the sound quality was remarkably good, due in some part to a somewhat unusual circuit called a "soft clipper" which takes the rough edges off the waveform when the amplifier is driven beyond the normal clipping level. Features include a stereo beacon; a three-LED AM FM tuning indicator (precise tuning indicated when only the center LED is lighted); 75 $\mu$ Sec. and 25  $\mu$ Sec. FM deemphasis; a 75 ohm coaxial FM antenna input in addition to the usual 75 300 ohm inputs; preamplifier-main amplifier separation, with two main amplifier inputs: one (*Lab*) is essentially flat from about 3 Hz, the other (*Normal*) has infrasonic and ultrasonic filters to remove unwanted signals outside the audio bandwidth (tests were

made with the *Normal* input). The receiver (for which there are optional 19-inch rack handles) has a rather plain appearance and, essentially, only basic receiver features. The performance however is anything but plain. The best description of the sound quality is "a pleasing, comfortable sound." It's just plain good, particularly when overdriven in an attempt to push volume levels towards the threshold of pain. The "soft clipper" rounds off the corners of the clipped waveforms, producing a wave that more closely resembles tube overload, rather than solid-state overload. Overload peak signals simply don't have the buzzing quality we've come to expect from solid state amps. The infrasonic and ultrasonic filters on the normal amplifier input have no effect whatsoever on the 20 to 20 kHz frequency response.

### INPUTS

- Magnetic Phono
- Aux
- Tape
- Main amplifier, flat (*Lab*)
- Main amplifier, filtered (*Normal*)
- 300 ohm FM antenna
- 75 ohm FM antenna
- 75 ohm FM coaxial antenna
- AM rod antenna
- External AM antenna

### OUTPUTS

- Two speaker systems
- Tape
- Headphones
- Preamplifier
- Switched AC receptacle
- Unswitched AC receptacle

### CONTROLS

- Concentric volume/and balance
- Ganged bass
- Ganged treble

### SWITCHES

- Power
- Speaker selection
- Input selection/FM muting
- Low level (audio mute)
- Loudness compensation
- Mono/stereo
- Tape monitor

### DIMENSIONS

- Width: 16.5 inches
- Height: 4.7 inches
- Depth: 9.5 inches
- Weight: 18.5 pounds

### FM TUNER PERFORMANCE

For 300 ohm and "Tee" antennas

Input level for full limiting	4.5 $\mu$ V
Mono hi-fi sensitivity (60 dB quieting)	10 $\mu$ V
Stereo hi-fi sensitivity (55 dB quieting)	65 $\mu$ V
FM mute release response	7 $\mu$ V
Stereo frequency response range	20 to 15,000 Hz
Stereo frequency response limits	+0/-1.2 dB
Mono distortion at standard test level	0.4% THD
Stereo distortion at standard test level	0.27% THD
Signal to noise ratio at standard test level	66 dB
Midband stereo separation	40+ dB
Alternate channel rejection (selectivity)	good
Stereo frequency response range at	
25 $\mu$ Sec deemphasis	20 to 15,000 Hz
25 $\mu$ Sec frequency response limits	+1.8/-0.1 dB

### AM TUNER PERFORMANCE

Average

### AMPLIFIER PERFORMANCE

With both channels driven to the clipping level into an 8-ohm load from 20 to 20,000 Hertz:

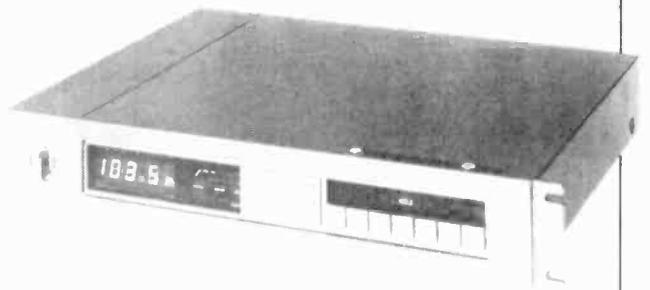
Power output	30 watts RMS
Frequency response at 30 watts RMS	+0/-0.5 dB
Total harmonic distortion at 30 watts RMS	0.017%
Tone control range at 50 Hz	+10/-11 dB
Tone control range at 10 kHz	+7/-8 dB
Filter attenuation at 20 Hz	None
Hum and noise—magnetic input (3 Mv in, 10 watts out)	-59 dB
Stereo separation—magnetic input	56 dB



# TUNERS

## SONY ST-J88B FREQUENCY SYNTHESIZED FM STEREO TUNER \$900

Circle No. 79 On Reader Service Card



The Sony ST-J88B is a quartz-locked frequency synthesized FM stereo tuner that just happens to be one of the very finest FM tuners we have seen in years. It is probably the precursor of what to expect in the next generation of precision FM tuners, for the ST-J88B is, in fact, the next generation. The sound quality is exceptional; low frequency overload characteristics for more than 100% transmitter modulation (usually a problem in synthesized tuners) is similarly exceptional. Dual IF selectivity—normal (wide) and narrow—is provided. Unlike the usual dual selectivity which is *fair* (wide) and *very good* (narrow), this tuner's selectivity is *very good* and *outstanding*; in the narrow mode we received literally a band full of signals on alternate (not adjacent) spacing, hearing many signals we did not even know existed (they are generally buried under alternate channel interference). The frequency readout is a digital display; tuning is in standard USA increments of 200 kHz (91.5, 91.7, etc.). Seven memories are provided which remember the frequency, desired selectivity, muting on or off, and auto stereo or mono mode. Labels for every frequency,

which can be slipped behind the bezel above each memory selector, are provided. Other features include a signal strength indicator directly calibrated in dBf (received signal strength). There is no tuning device because the frequency synthesizer is always precisely on the station frequency. There are three tuning modes: 1) Automatic—the FM band is scanned until a signal is received; 2) Manual—frequency can be changed rapidly or stepped one channel at a time; 3) Memory—pressing one of seven buttons selects a preprogrammed frequency and all its operating conditions. To select memory the user tunes to the desired frequency, sets all operating conditions, and then holds down a *memory switch* before pressing the memory selector. The memories are non-volatile (remembers programming) as long as the power cord is connected. Finally, this is one of the least complicated electronically-tuned FM receivers. A child could figure it out without the instruction manual. Overall, a notably outstanding example of the new, digital era of high fidelity equipment.

### INPUTS

- 300 ohm antenna
- 75 ohm antenna (coaxial jack)

### OUTPUTS

- Fixed line level
- Variable line level

### CONTROLS

- Output level (on rear apron)

### SWITCHES

- Power
- Tune Down
- Tune Up
- Stop automatic/Step tuning

- Normal/Narrow selectivity
- FM muting on-off
- Auto stereo/mono selector
- 7 memory selectors

### DIMENSIONS

- Width: 19.0 inches (relay rack panel)
- Height: 3.1 inches
- Depth: 14.5 inches
- Weight: 14.6 pounds

### FM TUNER PERFORMANCE

For 300 ohm and "Tee" antennas:

Input level for full limiting	3.0 $\mu$ V
Mono hi-fi sensitivity (60 dB quieting)	9 $\mu$ V
Stereo hi-fi sensitivity (55 dB quieting)	65 $\mu$ V
Stereo frequency response range	30 to 15,000 Hz
Stereo frequency response limits	+0/-0.5 dB
Mono distortion, Normal selectivity at standard test level	0.08% THD
Stereo distortion, Normal selectivity at standard test level	0.08% THD

Signal to noise ratio at standard test level	80 dB
Midband stereo separation, Normal selectivity	40+ dB
Midband stereo separation Narrow selectivity	50+ dB
Alternate channel rejection (selectivity)	Very good
Maximum variable output: level at 100% modulation	3.5 volts
Maximum fixed output level at 100% modulation	0.68 volts
Alternate channel rejection narrow selectivity	Outstanding
Mono distortion Narrow selectivity	0.3% THD
Stereo distortion Narrow selectivity	0.15% THD



# TUNERS



## TOSHIBA ST-335 MKII AM/FM STEREO TUNER \$179

Circle No. 77 On Reader Service Card

The Toshiba ST-335 MKII is an AM/FM stereo tuner featuring a stereo beacon, a three-position LED FM center channel tuning indicator, a five-step LED signal strength/AM tuning indicator, and a record calibration (Rec Cal) tone output for preadjustment of the input level to a tape recorder. The record calibration output is 6 dB below (-6 dB) the output level from a 100% modulated FM transmitter. The FM center channel tuning "meter" consists of two yellow LEDs

flanking a green LED; optimum tuning is attained when only the green LED is lit. However, tuning is relatively broad in the "green range," and distortion and separation values might vary from our measurements. The output is provided by two "patch cords," with phono plugs, approximately 1-meter in length. The FM pilot leakthrough is relatively high and a recorder's mpx filter must be used when making recordings from FM stations.

### INPUTS

- 300 ohm FM antenna
- 75 ohm FM antenna
- AM rod antenna
- AM external antenna

### OUTPUTS

- Fixed line level

### CONTROLS

- Tuning

### SWITCHES

- Power
- FM mute-Auto Stereo/FM mute off-mono only

- AM/FM selection
- Record calibration On-off

### DIMENSIONS

- Width: 16.5 inches
- Height: 3.8 inches
- Depth: 10.5 inches
- Weight: 6.5 pounds

### FM TUNER PERFORMANCE

For 300 ohm and "Tee" antennas:

Input level for full limiting	3.5 $\mu$ V
Mono hi-fi sensitivity (60 dB quieting)	11.0 $\mu$ V
Stereo hi-fi sensitivity (55 dB quieting)	90.0 $\mu$ V
Stereo frequency response range	20 to 15,000 Hz
Stereo frequency response limits	+0/-1.3 dB
Mono distortion at standard test level	0.6% THD
Stereo distortion at standard test level	0.4% THD

Signal to noise ratio at standard test level	67 dB
Midband stereo separation	37 dB
Alternate channel rejection (selectivity)	Very good
Maximum output level at 100% modulation	0.74 volts

### AM TUNER PERFORMANCE

Average with unusually low background noise level.



### HI-FI JARGON: IHF Tuner Sensitivity

The IHF sensitivity of an FM tuner or receiver is a measure of how much signal strength is required from the antenna in order to achieve a specified level of performance. There are two commonly specified sensitivities: the so-called "usable sensitivity" and the "50-dB-quieting sensitivity." The "usable sensitivity" is the input level required to achieve 30-dB suppression of distortion and noise in a fully modulated signal—hardly high-fidelity performance. The "50-dB-quieting sensitivity" tells you how much signal is needed to suppress the noise by 50 dB—a better criterion.

Even better is our own criteria: 55 dB quieting for stereo sensitivity and 60 dB for mono sensitivity. These standards really put a tuner to the test.

Sensitivity is also reported in "dBf" in specifications—the power level referred to 1 femtowatt—rather than microvolts. The smaller the sensitivity number, the more sensitive is the tuner.

Sensitivity should be specified separately for mono and stereo reception; the latter requires substantially more signal for equivalent quieting than mono reception.

### HI-FI JARGON: Tuner Selectivity

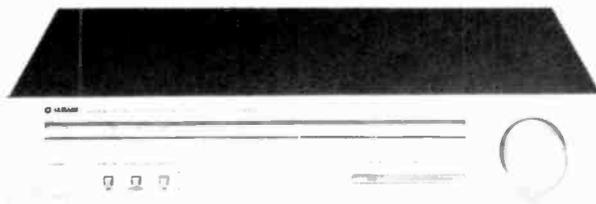
The selectivity of an FM tuner or receiver is a measure of how well it can discriminate against unwanted broadcasts at frequency assignments close to the desired station. FM channels are available at 200-kHz intervals across the 88-MHz to 108-MHz FM band. However, in any given area, two stations are never assigned to "adjacent" channels—those 200-kHz apart. The closest spacing in one area would be on 400-kHz intervals—the so-called "alternate channels."

Both alternate-channel and adjacent-channel selectivity may be specified; when only one figure is given, it is sure to be the "alternate-channel" one. The IHF specification is given in dB, and the greater the number, the better.

# TUNERS

## YAMAHA T-550 AM/FM STEREO TUNER \$190

Circle No. 76 On Reader Service Card



The Yamaha T-550 is an AM/FM stereo tuner companion to the A-550 stereo amplifier. Features include a stereo beacon, an LED tuning indicator combined with the dial pointer, a six-step LED signal strength indicator, a recorder calibration output of 333 Hz at 50 percent FM modulation, and a detachable AM loop antenna. The tuning indicator consists of two green LEDs flanking a red dial pointer and optimum tuning is supposed to correspond to equal brilliance of the LEDs. We attained best reception when the tuning was adjusted for maximum signal strength indication (which resulted in one green LED being brighter than the other) rather than

equal green LED brilliances. The record calibration output was equal to  $-4$  dB below 100 percent modulation, rather than the rated  $-6$  dB. AM reception is notably good under difficult conditions because the antenna loop snaps out of its mount, allowing positioning within the cabinet or shelves for optimum station reception. The connecting leads between the loop and the tuner's antenna terminals are 22 inches long, which allows for considerable variation in possible mounting locations for the loop. The FM reception is mono-only when the FM muting is off. When the muting is on reception is auto-stereo.

### INPUTS

- 300 ohm FM antenna
- 75 ohm coaxial FM antenna
- External AM antenna (also serves as connections for the supplied loop antenna).

### OUTPUTS

- Fixed line level

### CONTROLS

- Tuning

### SWITCHES

- Power
- AM/FM
- FM Muting
- Record Calibration

### DIMENSIONS

- Length: 17.1 inches
- Width: 3.75 inches
- Depth: 13.5 inches
- Weight: 9.9 pounds

### FM TUNER PERFORMANCE

Input level for full limiting	2.5 $\mu$ V
Mono hi-fi sensitivity (60 dB quieting)	8.0 $\mu$ V
Stereo hi-fi sensitivity (55 dB quieting)	65 $\mu$ V
Stereo frequency response range	30 to 15,000 Hz
Stereo frequency response limits	$\pm 0/-0.2$ dB
Mono distortion at standard test level	0.1% THD
Stereo distortion at standard test level	0.1% THD
Signal to noise ratio at standard test level	80 dB

Midband stereo separation	47 dB
Alternate channel rejection (selectivity)	Very good
Maximum output level at 100% modulation	0.44 volts

### AM TUNER PERFORMANCE

Background noise level is notably low. Removable loop often provides better reception than normally attained with an antenna affixed to the tuner.



### HOW WE TEST: FM Frequency Response

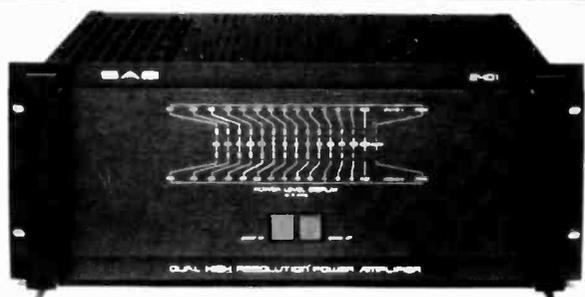
The F.C.C. requires that an FM station's frequency response meet proof-of-performance specs only in the range of 50 Hz to 15 kHz. Beyond this the broadcaster can do as he pleases: if he wants to bring the bass down below 50 Hz that's his prerogative; he is under no obligation to do so.

Some of the most respected names in hi-fi receivers and tuners have, from time to time, specified received frequency response in the proof-of-performance range of 50 Hz to 15 kHz. Others design and spec their FM receivers for the common lower bass limit of 30 Hz. Some spec down to 20 Hz, though the FM broadcast that goes down to 20 Hz is few and far between.

Our policy is to show the frequency response range specified by the manufacturer. If he claims a lower limit of say, 30 Hz, we test only down to 30 Hz. Because some listeners tend to assume "lower is better" we will not put a manufacturer at a disadvantage simply because he specs a 50 Hz limit to keep within the proof-of-performance frequency range. We will give the response down to 30 Hz if the performance is truly "hi-fi" down to 30 Hz.

Often, we show a high end limit less than 15 kHz, say 12 kHz. Better quality "general entertainment" receivers, which are budget products almost the equivalent of more expensive "hi-fi" receivers, often have a slightly reduced high frequency response; usually caused by inexpensive 19-kHz pilot signal suppression filters.

# AMPLIFIERS



## SAE 2401 250-WATT POWER AMPLIFIER \$950

Circle No. 84 On Reader Service Card

The SAE 2401 is a stereo power amplifier FTC rated for 8 ohms at 250 watts RMS per channel, 20 to 20,000 Hz, at less than 0.025% THD. Features include *normal* and *high pass* line level inputs. The high pass input is down 2 dB at 20 Hz, 12 dB at 5 Hz; it serves to keep low frequency thumps and turntable rumble out of the speakers. Other features are 13-step left and right LED output power indicators calibrated for 8 ohm loads from 0.06 to 250 watts. Additional LED indicators serve as an idle (power on) and peak overload indicator(s). An output hold-off prevents power supply turn-on

transients from being fed to the speakers. The amplifier measured absolutely "ruler flat" from 20 to 20,000 Hz. Note, however, that 2.3 volts input was required for the rated output power. This amplifier virtually coasts at maximum output power. It even delivers 300 watts at midband, and does not trigger automatic shutdown if the output power momentarily exceeds the maximum rating. (Good feature for a high power amp.) The LED output power indicator calibrations were unusually precise between 50 and 20,000 Hz. They indicated 3 dB higher than true output at 20 Hz.

### INPUTS

- Normal line level
- High pass line level

### SWITCHES

- Power on
- Power off

### DIMENSIONS

- Width: 19 inches relay rack drilled
- Height: 7 inches
- Depth: 12.5 inches
- Weight: 52 pounds

### OUTPUTS

- One speaker output per channel

### AMPLIFIER PERFORMANCE

With both channels driven to the clipping level into an 8-ohm load from 20 to 20,000 Hertz:

Power output	258 watts RMS
Frequency response at 258 watts RMS	Ruler flat
Total harmonic distortion at 258 watts RMS	0.02%
Hum and noise—magnetic input (2.3 volts in, 10 watts out)	—90 dB

Power meter accuracy at calibrations	Exact
Power meter frequency response within	
+3/—0 dB	20 to 20,000 Hz



### HI-FI JARGON: Dynamic Range

The dynamic range of a program is the ratio of the power of the strongest section to the power of the weakest section expressed in decibels. The dynamic range of a piece of equipment refers to the program dynamic range it can handle, and so it is synonymous with the signal-to-noise ratio when the reference signal is the maximum output capability of that piece of equipment. The dynamic range of a live program can easily exceed the dynamic range of many components.

### HI-FI JARGON: Power

Power is the amount of electrical energy delivered to the "load" (speaker) per unit time. It is measured in "watts." The *rated* power of an amplifier indicates the *maximum* power that the amplifier is capable of delivering to a given load impedance (usually 8 ohms) over a stated bandwidth (usually 20 Hz to 20,000 Hz) at a specified total-harmonic distortion (THD) for example, 0.1%. Thus an amplifier may be rated to deliver 100 watts per channel from 20 Hz to 20 kHz into an 8-ohm load at less than 0.1% THD.

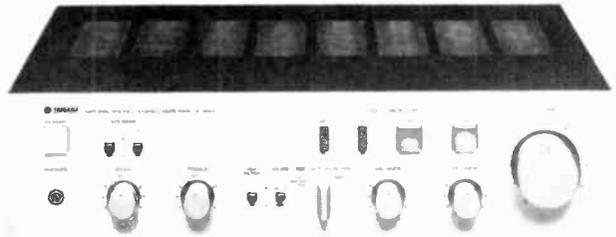
The fact that the amplifier carries a 100-watt rating does not mean that it is always delivering 100 watts per channel. At any given time, the power being delivered depends upon the musical signal strength. However, if the signal strength requires more than 100 watts at a particular instant in time, our hypothetical amplifier would not be capable of supplying it without excessive distortion.

With most solid-state amplifiers, the power capability depends upon the load impedance. More power can be supplied into a 4-ohm load than into an 8-ohm load and less-than-rated power is available into a 16-ohm load. While this suggests that a low speaker impedance would improve the power rating of an amplifier, there is a minimum safe load (usually 4 ohms) which the amplifier can handle. If the load is less than this amount, the amplifier's protective circuitry may be triggered on loud passages producing gross distortion.

# AMPLIFIERS

## YAMAHA A-550 40-WATT INTEGRATED AMPLIFIER \$250

Circle No. 85 On Reader Service Card



The Yamaha A-550 is an integrated stereo amplifier FTC rated for 8 ohms at 40 watts RMS per channel, 20 to 20,000 Hz, at 0.1% THD. When tested at the rated output power the total harmonic distortion was a maximum of 0.029%, which is considerably better than even the manufacturer's specification. A notable feature is a continuously variable loudness compensation that permits the user to precisely set the desired tonal balance for his or her preferred listening levels, rather than having to settle for an "average compensation." Other features include: a built-in subsonic filter for the phono channel that has no attenuation in the 20 to 20,000 Hz range (the corner frequency is 12 Hz; auto-

matic tape copy from and to either of two recorders; and an output hold-off that prevents power supply turn-on transients from being fed to the speakers. A somewhat unusual feature is a separate record output selector that allows recording of the phono or tuner input, or tape copy, regardless of the signal fed to the speakers. In its metal cabinet with no-frills front panel the appearance is somewhat Spartan compared to the styling of many contemporary amplifiers. The sound quality, however, is excellent, particularly at lower volume levels where the variable loudness compensation can be tailored to precisely compensate for the user's own hearing characteristics.

### INPUTS

- Magnetic phono
- Tuner
- Two tape

### OUTPUTS

- Two speaker systems
- Two tape
- Headphones
- Two switch AC receptacles
- One unswitched AC receptacle

### CONTROLS

- Volume
- Loudness compensator
- Balance
- Ganged bass
- Ganged treble

### SWITCHES

- Power
- Speaker system A
- Speaker system B
- High filter

- Stereo/mono mode

- Record output/tape copy selector
- Input selectors

### DIMENSIONS

- Width: 17.1 inches
- Height: 4.5 inches
- Depth: 13.3 inches
- Weight: 17.2 pounds

### AMPLIFIER PERFORMANCE

With both channels driven to the clipping level into an 8-ohm load from 20 to 20,000 Hertz:

Power output	40 watts RMS
Frequency response at 40 watts RMS	+0.5/-0 dB
Total harmonic distortion at 40 watts RMS	0.029%
Tone control range at 50 Hz	+12/-10 dB

Tone control range at 10 kHz	±10 dB
Hum and noise—magnetic input (3 Mv in, 10 watts out)	-75 dB
Stereo separation—magnetic input	57 dB



### HI-FI JARGON: Frequency Response

The typical human ear can detect the sound of air vibrating at a frequency as low as 20 Hertz (cycles per second) or as fast as 20,000 Hertz. A good measure of the quality of a hi-fi component is its ability to deliver equal output at all audio frequencies from 20 to 20,000 Hertz. A small speaker will usually have a poor output (low-frequency response) at the 20-Hertz end of the audio spectrum. It will not reproduce the rich, thumping low tones of a pipe organ as well as it does the middle and high frequencies. Cassette tape, on the other hand, has trouble with the higher treble frequencies above 12,000 Hertz. This loss in high-frequency response is heard as a lack of crisp realism: sharp cracking or pinging sounds are muted and dull. The differences in sound level are measured in decibels (dB). One dB is generally considered the minimum detectable sound-level difference, 3 dB is a significant change and 10 dB represents either a doubling or halving of the sound level. A good phono cartridge's frequency response may be said to be within 1 dB from 20 to 20,000 Hz; that means there would barely be any noticeable sound level change at any frequency. If it was said to be -7 dB at 18,000 Hz then you would hear a very significant weakness in the high-frequency response. An ideal frequency response is "flat" (0 dB) from 20 to 20,000 Hz.

# TURNTABLES



## MICRO SEIKI DD-31 TURNTABLE \$375

Circle No. 65 On Reader Service Card

The Micro Seiki DD-31 is a two-speed (33, 45 rpm), direct drive, electronically-controlled record player with an integral wood base and a dust cover. The pickup is provided by the user. Start up is manual: the motor is started by pressing an operate button and the tonearm is manually positioned over the record and then lowered with a cue button. At the end of play the tonearm automatically lifts and the motor is turned off. There is no reject to interrupt and recycle the tonearm. The platter has full-time illuminated 33 and 45 rpm strobes embossed around the rim. A single pitch control serves for both speeds. The tonearm has a micro-adjust counterweight that also serves as an

0 to 3 gram VTF adjustment calibrated in 0.5 gram increments that can be estimated within 1/8 gram accuracy between calibrations. There is a calibrated anti-skate. The pickup mounts in a proprietary plug-in shell for which a stylus overhang gauge is provided. The gauge appears to be an afterthought and does not align automatically. Take extra care when using the gauge that it is parallel to the surface of the pickup shell. The tonearm rest has a "light" tonearm friction-lock. This record player has above average resistance to external shock and vibration and might prove an excellent choice where the record player must be mounted on "shaky" shelves and furniture.

### CONTROLS

- Pitch

### SWITCHES

- Speed select
- On
- Off
- Tonearm lift

### DIMENSIONS

- Width: 18.4 inches
- Height: 6.1 inches
- Depth: 14.75 inches
- Weight: 17.4 pounds

### TURNTABLE PERFORMANCE

Line voltage immunity (90 to 140 volts) .....	Total
Pitch control range at 33 rpm .....	+7/-6%
Pitch control range at 45 rpm .....	+9.5/-7%
Wow and flutter (average) .....	0.04%
Wow and flutter (peak) .....	0.12%

Tracking force calibration accurate to ..... 1/8 grams  
Output cable capacitance ..... 130 pF



### HI-FI JARGON: Separation

While stereo reproduction implies two distinct channels—one left and one right—most of our program sources bring both to us on a common medium. In FM reception, both channels are carried on the same transmission frequency; both channels are cut into the same record groove; and, both are recorded on the same length of tape. It is not surprising, therefore, that some of the left-channel information gets mixed in with the right and vice versa.

The separation specification of a high fidelity component tells you how well the two channels are kept apart. It is the ratio of the desired signal to the undesired one, expressed in decibels. The greater the number, within reasonable limits the better. Separation is usually best in the middle range of frequencies and deteriorates at both extremes. A "1 kHz separation" figure doesn't tell you what happens elsewhere; better that the spec be given as "greater than X dB separation from 100 Hz to 10 kHz," though this can often mislead the less technically informed.

### HI-FI JARGON: Pre-emphasis

Many recording and transmission links—disc, tape, or broadcast—can accommodate greater signal levels at some frequencies than at others. Furthermore, common audio programs—music and voice—do not have a "flat energy-distribution spectrum." Greater levels are likely to be found in the lower and upper midrange than in the extreme bass and treble. Pre-emphasis is a technique to match the probable program content with the capabilities of the medium. Before recording or transmission, certain frequency ranges are pre-emphasized or boosted to take fuller advantage of the medium's potential. Upon playback or reception, compensatory de-emphasis is used to restore the tonal balance and simultaneously reduce the noise in those frequency regions.

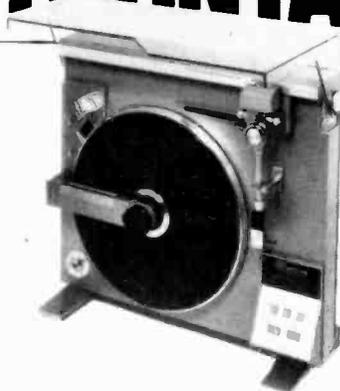




# TURNTABLES

## MITSUBISHI LT-5V VERTICAL, LINEAR TRACKING TURNTABLE \$450

Circle No. 105 On Reader Service Card



The Mitsubishi LT-5V is a somewhat unusual record player in that it normally operates in a vertical position with a linear tracking tonearm that hangs straight down. The unit has two speeds (33, 45 rpm), with individual 33 and 45 pitch adjustments and a full-time illuminated strobe for each speed. Optical sensors provide automatic tonearm indexing for 7 inch and 12 inch records. The sensors also protect the stylus from damage in that they do not allow the tonearm to "lower" unless there is a record on the platter. If there is no record the tonearm sweeps above the record and then returns to its rest. Operation is automatic. The start button causes the motor to start and the tonearm to cue. At the end of play the tonearm "lifts" and returns to its rest, and the motor is turned off. The system can be rejected at any point by pressing a stop switch. Alternately, it can be programmed for continuous repeat play. The pickup mounts in a universal shell for which an unusually accurate overhang elevation position gauge is provided. A 0 to 2.5 gram VTF adjustment calibrated in 0.1 gram increments is provided,

but because of the vertical mounting it is impossible to test for VTF adjustment accuracy with conventional gauges. The player cannot be placed "flat" (horizontal) for checking the VTF because doing so results in meaningless measurements. Since Mitsubishi turntables have consistently had accurate VTF adjustments, we will assume this one is also accurate. (Using a stylus displacement test procedure, we estimate the VTF is accurate to at least 0.25 gram—though 0.25 gram is the limit of the test procedure.) The tonearm rest not only has a positive locking tonearm clamp, the clamp also serves as the master power switch. The record player is a beautiful piece of machinery, and the sound quality actually does appear to be better from the inner record grooves. The system is unusually immune to external shock and vibration, and can take one heck of a beating before the stylus skips a groove. Overall, the LT-5V works and sounds as good as it looks. For more information, see "Spotlight on the LT-5V" elsewhere in this issue.

### CONTROLS

- Speed select
- 33 pitch
- 45 pitch
- Start
- Stop (reject)
- Lift/Cue
- Repeat play
- Master power/tonearm lock

### DIMENSIONS

- Width: 18.4 inches
- Height: 17 inches
- Depth: 7.9 inches
- Weight: 27.5 pounds

### TURNTABLE PERFORMANCE

Line voltage immunity (90 to 140 volts)	..... Total
Pitch control range at 33 rpm	..... +6.9/-2.3%
Pitch control range at 45 rpm	..... +7.9/-5.9%
Wow and flutter (average)	..... 0.03%
Wow and flutter (peak)	..... 0.12%

Tracking force calibration accurate to 0.25 gms (see text)  
Output cable capacitance ..... 260 pF



### HI-FI JARGON: Wow and Flutter

Speed variations of a tape recorder or record player alter the pitch of the music. If the speed is consistently slow or fast by a small amount, most people are unable to detect the error; few of us have "perfect pitch." But, if the speed changes—even slightly—we react immediately. Slow variations in speed cause a slow change in pitch called "wow," faster ones cause the music to "flutter."

# TURNTABLES



## THORENS TD-105 TURNTABLE \$335

Circle No. 61 On Reader Service Card

The Thorens TD-105 is a two-speed (33, 45 rpm) belt driven, electronically-controlled, record player with integral base and dust cover; the pickup is provided by the user. The player is semi-automatic. The motor starts when the tonearm is moved off its rest; at the end of play the tonearm lifts, returns to its rest, and the motor turns off. The tonearm also cycles to off if the stop button is activated. The power supply is a plug-in AC adapter package similar to those supplied with calculators. There appears to be no operating reason for this arrangement; it only makes it easier to provide for differing power source voltages. There are touch-sensors for speed selection and stop; individual controls for 33 and 45 pitch. A 33 rpm strobe is cut into the platter's rim; it is illuminated by two LEDs

behind the rim which are somewhat difficult to see unless the user sights in on an almost direct line with the rim and LEDs. The 45 strobe is imprinted on the 45 rpm center-hole adapter and cannot be seen under incandescent light. The tonearm has a micro-adjust counterweight that also serves as an 0 to 3 gram VTF adjustment calibrated in 0.25 gram increments. There is a calibrated anti-skate. The pickup mounts in a proprietary carrier that is part of plug-in tonearm section. A simple, but rather good, combination stylus position and overhang gauge is provided. The tonearm rest has a positive lock. The record player has an unusually high resistance to external shock and vibration, and might prove an excellent choice for use on shaky floors and furniture.

### CONTROLS

- 33 speed
- 45 speed
- Stop
- 33 pitch
- 45 pitch
- Tonearm lift

### DIMENSIONS

- Width: 17.1 inches
- Height: 5 inches
- Depth: 14 inches
- Weight: 12 pounds

### PERFORMANCE

Line voltage immunity (90 to 140 volts) . . . Essentially total  
 Pitch control range at 33 rpm . . . . . +5.5/—6.8%  
 Pitch control range at 45 rpm . . . . . +7.0/—7.0%  
 Wow and flutter (average) . . . . . 0.04%  
 Wow and flutter (peak) . . . . . 0.12%

Tracking force calibration accurate to . . . . . 1/8 grams  
 Output cable capacitance . . . . . 280 pF



### HI-FI JARGON: Harmonic Distortion

Ideal high-fidelity components would handle all types of signals without changing their character in any sense. In practice, this ideal is approached but not attained. Any unwanted change in the signal can, in general, be called "distortion."

Harmonic distortion refers to a particular type of change caused by a nonlinearity in gain that is a function of instantaneous signal amplitude. Such a nonlinearity generates "harmonics" in a pure tone (sinewave). These harmonics are additional components at frequencies that are whole multiples of that of the original tone. Thus, when a 1-kHz sinewave is applied to the component, it may add to it a small amount of second harmonic (2 kHz), third harmonic (3 kHz), etc. The ratio of the total power of these unwanted harmonics to the power of the "fundamental" (1 kHz), expressed as a percentage, is the "percent total harmonic distortion" or THD.

### HOW WE TEST: "Average" Performance

Readers often ask what we mean when we say that the performance of a piece of equipment is average. We have established high critical standards for all pieces of equipment that are reviewed on these pages. After all, we are concerned with high fidelity components—not just any gear that produces sound. An average rating means that the component meets our rigid performance standard and is a good buy in its price range. For example, if a \$1000 receiver is rated average, this means that it is the equal of other average \$1000 receivers, superior to an average \$600 receiver, and far superior to an average \$200 receiver.



# PHONO PICKUPS



## EMPIRE 600 LAC MAGNETIC PHONO PICKUP \$175

Circle No. 98 On Reader Service Card

The Empire 600 LAC is a magnetic phono pickup with a stylus of special proprietary design. Rated tracking force (VTF) is 1 to 2 grams, with 1.5 grams specifically recommended. (Tests were conducted using 1.5 grams.) The stylus assembly incorporates a swing-down stylus guard. The pickup is designed to work into a capacitance of 150 pF, which more or less matches the range of 120 to 150 pF common to modern

### CARTRIDGE PERFORMANCE

Frequency response limits ..... +1/—1 dB  
 Frequency response range ..... 20 to 20,000 Hz  
 Channel balance ..... 1 dB  
 Stereo separation at 1,000 Hz (worst case) ..... 32+ dB

record players. The sound quality is outstanding. It is exceptionally clean, with an overall sound quality described by some in the listening panel as "silky," though at this level of performance the listener must search for their own nuances in sound quality. (Pay particular attention to the deep bass; this pickup often brings out deep bass generally not heard. The frequency response was unusually flat.)

Stereo separation at 15,000 Hz (worst case) ..... 32+ dB  
 (Note. Separation was beyond [better than] the 32+ dB limits of our test equipment.)



## MICRO-ACOUSTICS MODEL 382 SYSTEM II ELECTRET PHONO PICKUP \$120

Circle No. 99 On Reader Service Card

The Micro-Acoustics model 382 System II is an electret phono pickup designed for direct connection to a standard magnetic phono input. The stylus is a special proprietary design. A user-applied plastic stylus guard is provided. The rated tracking force (VTF) is 0.75 to 1.5 grams. The pickup is essentially immune to cable capacitance and phono input resistance: the rated resistance range is 5K to 100K ohms, which includes all resistance values common to high fidelity

### CARTRIDGE PERFORMANCE

Frequency response limits ..... +1/—2.5 dB  
 Frequency response range ..... 20 to 20,000 Hz  
 Channel balance ..... 1 dB



equipments. Varying the output cable capacitance between the extreme limits common to amplifiers produces neither audible or measurable differences. The sound quality is excellent. It is very clean, and described by some in our listening panel as "silky," though most stated that "at this level of performance the listener must search for their own nuances in sound quality." Best sound quality was attained with 1.2 to 1.5 grams VTF.

Stereo separation at 1,000 Hz (worst case) ..... 20 dB  
 Stereo separation at 15,000 Hz (worst case) ..... 20 dB



### HOW WE TEST: Cassette decks

Cassette decks are tested with the type or brand of tape specified by the manufacturer. When the manufacturer specifies only a generic type, or several brands, we test the machine with a wide assortment of tapes, presenting the values for the tape that gives the best overall results at the lowest possible cost.

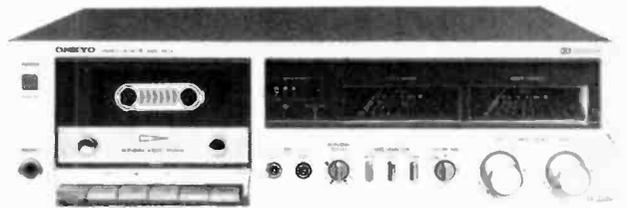
Since it is common practice for the user to use the meter indicated 0-VU or 0-dB as the maximum record level, we utilize this value as the maximum record reference for all tests, even when there is considerable headroom above 0-VU. This is because the tape you use might not have the same amount of headroom, and it is almost impossible to provide accurate 0-VU or 0-dB maximum record level "correction values" for each type of tape.

To avoid erroneous test values caused by variations in tape formulations, machines are tested with the tapes available in high fidelity stores at the time the tests are made. We do not use "last years'" tapes, or experimental samples.

# CASSETTE DECKS

## ONKYO TA-2020 STEREO CASSETTE DECK \$225

Circle No. 96 On Reader Service Card



The Onkyo TA-2020 is a front loading Dolby cassette deck for ferric, ferrichrome-bias, chrome-bics, and metal tapes. Major feature is an 'Accubias' system which consists of automatic sensing of "high bias" notches in chrome-bias cassette shells, and a front panel variable bias adjustment for which extensive illustration and calibration charts are supplied (listing virtually every popular tape available in the U.S.). Since it is necessary, however, to select the proper equalization with one of three tape-type switches (*normal, high, metal*) the automatic bias selection really serves no purpose (the *metal* switch also determines the metal bias). The bias control calibrations, however, proved very accurate, and quite good results were attained with a broad selection of tape brands

and types. The tape calibration charts do not include ferrichrome tapes. Instructions for using ferrichrome did not produce acceptable results, and we suggest that only ferric, chrome-bias and metal tapes be used. Other features include left and right record level meters, a reset counter, automatic end of tape stop, and timer control through a power-pause. The power-pause works this way: The tape mechanism is set for record (or play) and the pause control is depressed. When the timer applies power to the cassette deck the power surge "pops" the pause control and the tape drive starts. At the end of the tape the drive stops and disengages. Overall, the performance is well beyond what is implied by what is essentially a budget price.

### INPUTS

- Microphones
- Line

### OUTPUTS

- Line
- Headphones

### CONTROLS

- Left record level
- Right record level
- Accubias adjust

### SWITCHES

- Power
- Normal tape
- High tape
- Metal tape
- Dolby in-out

### TAPE MECHANISM CONTROLS

- Record interlock
- Rewind
- Play

- Fast forward
- Stop/eject
- Pause/timer control

### DIMENSIONS

- Width: 16.6 inches
- Height: 4.75 inches
- Depth: 10.6 inches
- Weight: 10.6 pounds

RECORD/PLAYBACK TAPE PERFORMANCE		Frequency Response										
		Tape Type	Record Level	Dolby on/off	Frequency Range		Signal Level		THD at meter indicated 0 VU level	Headroom to 3% THD	Signal to Noise Ratio	
					Max.	Min.	10 dB	46 dB			Wide-band	Narrow band
Maxell UD/XL I	F	-20 dB	off	30-13k	+0	-3	1.2%	10 dB	46 dB	—	—	—
Maxell UD/XL I	F	-20 dB	on	30-12k	+0	-3	1.0%	10 dB	50 dB	56 dB	—	—
Maxell UD/XL II	C	-20 dB	on	30-13k	+0	-3	0.8%	7 dB	54 dB	59 dB	—	—
TDK-MA	M	0 dB	on	35-11.5k	+0	-3	1.4%	8 dB	53 dB	58 dB	—	—
TDK-MA	M	-20 dB	on	35-15k*	+1.2	-2.5	—	—	—	—	—	—

KEY  
F - Ferric  
C - Chrome  
R - Ferrichrome  
M - Metal

\*Dolby test range 20 to 15,000 Hz

### PERFORMANCE

Playback frequency response from standard test tape with a 40 to 12,500 Hz range ..... +1.2/1 dB  
Output level corresponding to 0 VU level ..... 350 mV  
Wow and flutter (average) ..... 0.08%  
Wow and flutter (peaks to) ..... 0.11%



# CASSETTE DECKS



## PHILIPS N5781 CASSETTE DECK \$569

Circle No. 95 On Reader Service Card

The Philips N5781 is a front loading, dual capstan, three-head system (simultaneous record/playback) Dolby cassette deck for ferric, ferrichrome-bias, chromium-bias, and metal tapes. Right off we'll state the machine is an award-winner in performance—one of the best we've seen in terms of sound quality. Among the many features are a two-tone Dolby sensitivity/bias calibration system, bar-graph peak or peak-hold record level meters, microphone/line input mixing and a master gain control in addition to the mic and line mixers, a record mute, timer controlled record and

play, a pitch control (variable speed for playback-only), and an RF interference suppressor. An electronic counter (not a timer, though it might appear to be timing) is part of a programmable auto-rewind/auto-play system. The user can program a start count and end count. Pressing either fast wind control will cause the tape to advance to the start count, play, and then rewind when reaching the end count. After rewind the tape can be programmed to stop or repeat-play. Somewhat inconvenient, the start and end program-

(Continued on page 66)

### INPUTS

- Microphones
- Line

### OUTPUTS

- Line
- Headphones

### CONTROLS

- Concentric L & R microphone level
- Concentric L & R line level
- Master record level
- Ganged output level
- Left Dolby calibrate
- Right Dolby calibrate
- Left bias calibrate
- Right bias calibrate
- Pitch (playback vari-speed)

### SWITCHES

- Power
- Tape line
- Dolby/Dolby filter
- Tape/source monitor
- Peak/Peak-hold metering
- Tape test oscillator frequency
- Timer control selector
- Counter reset
- Memory No. 1
- Memory No. 2
- Programming execution
- Automatic rewind selector
- Automatic replay selector
- RFI selector (on rear apron)
- Record mute

### TAPE MECHANISM CONTROLS

- Stop
- Record interlock
- Rewind
- Start
- Fast Forward
- Pause
- Eject

### DIMENSIONS

- Width: 17.8 inches
- Height: 4.9 inches
- Depth: 13.2 inches
- Weight: 14.8 pounds

RECORD/PLAYBACK TAPE PERFORMANCE		Tape Type		Record Level	Dolby on/off	Frequency Range in Hz	Frequency Response		Signal Level in dB	THD at meter indicated 0-VU level	Headroom to 3% THD	Signal to Noise Ratio
		Max.	Min.				Wide-band	Narrow band				
TDK-D	F	-20 dB	off	20-15k	+1	-1	1.2%	8 dB	48 dB	—	—	—
TDK-D	F	-20 dB	on	20-15k*	+0.6	-1.3	1.0%	8.5 dB	52 dB	56 dB	—	—
Sony Ferrichrome	R	-20 dB	on	20-15k*	+0	-2.5	0.8%	10 dB	54 dB	59 dB	—	—
TDK-SA-X	C	-20 dB	on	20-15k*	+2	-1	0.6%	11 dB	55 dB	60 dB	—	—
TDK-MA	M	0 dB	on	20-11.5k	+2	-3	0.7%	8 dB	54 dB	60 dB	—	—
TDK-MA	M	-20 dB	on	20-15k*	+2.5	-1	—	—	—	—	—	—

KEY  
F = Ferric  
C = Chrome  
R = Ferrichrome  
M = Metal

\*Dolby test range  
20 to 15,000 Hz

### PERFORMANCE

Playback frequency response from standard test

tape with a 40 to 12,500 Hz range . . . . +0.5/-0.7 dB

Output level corresponding to 0 VU level . . . . max. 1 volt

Wow and flutter . . . . . 0.09% steady



# TAPE DECKS

## PIONEER RT-901 OPEN REEL TAPE DECK \$795

Circle No. 141 On Reader Service Card



The Pioneer RT-901 is a two-speed (7½, 3¼ ips), three-motor, three-head system (simultaneous record and playback), closed-loop capstan drive (two capstans), reel-to-reel four-track stereo tape deck accommodating reel sizes to 10½ inches. EIA reel locks are built in; NAB hubs are provided for 10½ inch reels. Features include microphone and line input mixing; left and right bar-graph average and peak reading level meters; two levels of bias and equalization and a chart of the bias and equalization values of many commonly used and popular tapes; a 6% pitch control (playback only) detented at the "normal" position; an electronic digital counter; a preset for timer controlled start; automatic end of tape stop; automatic tape lifting through the capstan system; and individual left and right channel record selectors in addition to the usual record interlock. The playback frequency response from a standard tape at 7½ ips showed a slightly rising response at both the upper highs and deep lows. Though within 2.5 dB limits, the response produces a slightly mellow and bright sound from prerecorded tapes. At 3¼ ips the response is within 1.5 dB over the test tape

range of 50 to 7500 Hz. The performance results for Maxell UD tape can be substantially improved by using different bias or equalization values than shown in the supplied chart. (The results shown were attained using the recommended bias/eq. values.) This is also true of other tapes we tried. Wow and flutter was spectacularly low; the equal of many professional machines—and better than some so-called "pro" decks. Erasure, however, left something to be desired. Though it eliminated prerecorded program and tone, it did not eliminate low frequency "pulsing" caused by improper bulk tape erasure. On a wide-range reproducing system the pulses (at -40 dB peak) could be heard as "thumps" in the background. Our recommendation is to make certain you bulk erase properly: spinning the tape through the magnetic field as it is removed from the eraser. The pitch control provided a range of +9%/-6.5% at both speeds. The "peak" reading level meter has a relatively fast decay, more or less accurately tracking the peak record signal. The "average" metering provides a more "damped" level display; the type associated with VU-metering.

### INPUTS

- Microphones
- Line level

### OUTPUTS

- Line level
- Headphones

### CONTROLS

- Concentric-clutched L & R microphone level
- Concentric-clutched L & R line level

- Concentric-clutched L & R output level
- Pitch

### SWITCHES

- Power
- Timer start on-off
- Tape/source monitor
- High/low bias
- High/low equalization
- Left record on-off
- Right record on-off

- Small/large reel size selector
- Speed selection
- Counter reset

### TAPE MECHANISM CONTROLS

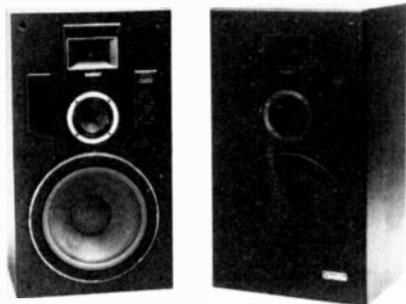
- Record interlock
- Rewind
- Fast forward
- Play
- Stop
- Pause

RECORD/PLAYBACK TAPE PERFORMANCE		Frequency Response								
		Tape Type	Dolby on/off	Frequency Range in Hz		Signal Level in dB		THD at meter indicated 0 VU level	Headroom to 3% THD	Signal to Noise Ratio
				Max.	Min.	Max.	Min.			
Maxell UD 7½ ips -10 dB record level	F	—	20-20k	+0	-3.0	0.4%	10 dB	55 dB	—	KEY: F = Ferric C = Chrome R = Ferrichrome M = Metal
Maxell UD 3¼ ips -10 dB record level	F	—	33-12k	+0	-3.0	0.5%	9 dB	54 dB	—	

### PERFORMANCE

Playback frequency response from standard 7½ ips  
test tape with a 50 to 15,000 Hz range ... +2.5/-0 dB  
Playback frequency response from standard 3¼ ips  
test tape with 50 to 7,500 Hz range ... +1.2/-0.5 dB

Maximum output level corresponding to 0-VU  
level ..... 0.9 volts  
Wow and flutter at 7½ ips ..... 0.02%  
Wow and flutter at 3¼ ips ..... 0.04%



Circle No. 110  
Reader Service Card

Additional features include an automatic power control with lighted indicator and anechoic damping of baffle with foam alloy sound deadening.

**Computing Cassette Deck**

Nakamichi's model 1000ZXL cassette deck breaks new ground in automation and performance because an A.B.L.E. computer tests any tape you use, and then manipulates recording characteristics to provide the best possible recordings. Response is said to be flat within  $\pm 0.5$  dB from 20 to 20,000 Hz ( $\pm 3$  dB, 10 to 25,000 Hz) using any of today's better tape formulations. A unique bias-range switch is expected to

permit equally efficient handling of tapes yet to be developed. Thus the equipment should not become obsolete very soon. The 1000ZXL also features a true Random Access Music Memory (RAMM) that permits tagging as many as 15 programs with codes, either automatically or manually. The deck's computer then conducts a bi-directional, high-speed search for any desired program and, when it's found, goes into playback mode. The computer accepts up to 30 commands and can find and play the selections in any sequence desired. Each code also contains information by which the unit automatically



Circle No. 107 On Reader Service Card

sets playback equalization and noise-reduction circuitry. The 1000ZXL can use its own Double Dolby or an external noise-reduction system. Other

features: Tri-microphone; dual-line input mixer; 50-dB range dual-ballistic FL display; selectable subsonic and MPX filters; test tone generator; new Parametric erase system. Price: \$3,800.

**LH Open-Reel Tape**

BASF Systems offers a new LH open-reel tape designated Ferro LH DP 26 and described as a high quality, high-output, low-noise ferric oxide reel-to-reel product having a built in sensing



Circle No. 97  
On Reader Service Card

foil and sturdy plastic library box. The LH 26 is claimed to be one of the most popular open-reel tapes in Europe, and is now available in the U.S. on 7-inch plastic reels holding 1800 to 3600 foot lengths. The suggested retail prices: 1800 feet, \$12.99; 2400 feet, \$16.99; 3600 feet, \$21.99.

**HEADPHONES**

The YH-100 is the only closed-back model tested in this series. It is finished entirely in black with twin steel headbands and a soft plastic support underneath. There are two adjustments and the 3-inch earpieces are suspended by universal joints. The soft foam pads are not detachable.

**Test Results**

*Output at 1 volt: 98 dB SPL*  
*Maximum output: 116 dB SPL*  
*Distortion at 100 dB SPL: 1%*  
*Comfort rating: A,B,B,B.*

The frequency response had a slight rise from 1 kHz to 3 kHz, continuing smoothly to 7 kHz where it fell sharply, rising to a higher level at 12 kHz and rolling off from 19 kHz. At the low end,

output increased from 400 Hz, reaching a maximum level in the 70 Hz to 200 Hz band and falling below 40 Hz. Sound quality was notable for a strong bass with a slightly restrained upper-midrange giving a "laid-back" effect to vocal items. String tone was excellent but brass instruments tended to lack "bite." Circle 72. ▲

**TEST REPORT: PHILIPS N5781**

ming must be done by advancing the tape to the desired start and stop, and punching the programming buttons to enter the counter reading in the memories. Also, the counter cannot be reset to zero while the tape is running. An RF interference suppressor is included for those who record from AM and shortwave. It appears to be a slight shift in bias oscillator frequency so the bias harmonics don't beat against the radio stations in the radio. (A darn good idea.) The recording meters can be set for peak rise/moderate decay (providing a "telescopic" or "collapsing" display after the peak

indication), or peak-hold, which retains the maximum peak reading until it's exceeded by a greater peak. The pitch control range measured  $+10/-12\%$ .

The recorded sound quality was exceptionally good, primarily due to a notably flat response from 20-15,000 Hz (ferrichrome tape from 30-15,000 Hz), and a somewhat higher than usual "headroom" for all tapes in general. Unfortunately, neither the rather conventional styling nor measurements imply the inherent high performance of this machine. ▲

**AUDIO ACCESSORIES**

like pad attached to the turntable spindle. One manual revolution of the pad around a disc constitutes an effec-

tive application.

A relatively recent record care product is the preservative fluid, which is

buffed into the grooves and is claimed to provide extended record stylus life by lubricating the grooves. Antistatic

properties are also improved. Sound-Guard offers a record preservation kit that includes Preserving Fluid, applicator and a special buffer (\$9.95). Other products of this type are Audio-Technica's Lifesaver (\$12.95) and Stanton's Permostat (\$19.95).

Contaminants that adhere to the stylus during the playing of a record can grind debris into the grooves of any disc subsequently played, and lead to its ultimate destruction. It's no wonder that accessories firms are focusing increased attention on stylus care products. Discwasher offers its SC-2 Stylus Care System (\$6.00), comprised of a brush made of high density nylon fibers and a fluid designed to dissolve stylus grit without harming the delicate parts of the stylus and its mounting. The other side of the brush contains a clever magnifying mirror for inspection of the stylus. A similar kit is offered by Pickering (\$10.95). It contains fluid, long handled brush and mirror, plus a magnifying glass. Audio-Technica's stylus cleaning solution (\$3.95) features a soft brush integrated into the bottle cap. Be advised that your phono stylus is extremely fragile. The utmost care must be taken in any cleaning procedure.

**Zappers.** Each time you take a record from its sleeve, you're charging it with static electricity that results in audible pops, clicks and crunches, and also attracts dust to the disc surface. Several products address themselves specifically to the problem of static build-up. There are three general types: guns, mats and sleeves. Anti-static guns neutralize static electricity by showering the disc with ions when you pull the trigger (or push the button) from a foot or so away from the surface. The record must be treated prior to each playing. The most widely available guns include the Discwasher Zerostat (\$20), Bib Groovstat (\$35), Nagaoka Kilavolt by Osawa (\$50) and Robins Rob-O-Stat (\$24).

An interesting offshoot of this product combines a cleaning brush with the gun for removing surface grit before destating the disc. The Antistat comes from Hervic Electronics (\$20) and Le-Bo markets the Stat Brush (\$25).

If you're the non-violent sort, you may prefer the mat to the gun. An anti-static mat either replaces or sits atop your regular turntable mat. It must be in contact either with the spindle or the metal platter. The mat contains carbon fibers which make it conductive, and so draw the static electricity from your discs. Commonly available mats include the Discwasher D'Stat II (\$8.50), Empire Anti-Static Record Mat (\$9), Goldring EXstatic (\$15) and Scotch Dustguard (\$6). Inciden-

tally, the anti-static mats should not be confused with high density anti-resonant mats designed to inhibit turntable and disc resonant vibrations that may be picked up by the phono cartridge and reproduced as distortion. These mats have no anti-static properties. They are available from Reference Monitor (\$55), Osawa (\$23) and Monster Cable (\$35).

Special record sleeves made of static inhibiting material are designed to replace the paper or plastic sleeves that come with your albums. They are available from Discwasher (10/\$2.75), Calibron (10/\$5) and Empire (10/\$2.50).

**Firm Footing.** When your floor vibrates from either your footfalls or the sound energy of your records, annoying acoustic feedback can distort your music. Isolating your turntable from its surroundings can prevent this distortion. We tried three products designed to accomplish this:

● **Audio-Technica Audio Insulator System**—Four vibration absorbing pods are placed underneath the turntable, either in conjunction with or replacing the existing feet. Each pod is individually height adjustable to maintain turntable levelling. A bubble level is provided. (\$26.95)

● **Discwasher Discfoot**—When positioned under your turntable's existing feet, these four isolators add an extra measure of vibration isolation, plus damping. For turntables with an inner suspension, the units may be placed under each corner of the base, not necessarily under the support nubs. (\$22)

● **Whiting Iso-Base**—The upper heavy wood platform of this two-piece unit is coupled to the lower base portion by springs, specially designed with a low resonance frequency. Polyurethane damping material in the springs enhances the isolation. The turntable is simply placed onto the Iso-Base. The top and sides of this hefty unit are finished in walnut. (\$49; \$55 west of the Mississippi)

**Aligners.** One of the most frequently ignored forms of distortion is caused by the misalignment of your cartridge in the tonearm headshell. Many audiophiles are just beginning to realize the dramatic improvement in sound resulting from proper alignment. A new category of product, the alignment protractor, is responsible for this acoustic awakening. The following protractors are currently available: Cart-A-Lign from Cart-A-Lign Research Corp. (\$30); Dennesen Geometric Sound-Tracktor (\$35, plastic; \$100, metal); DB Systems DBP-10 (\$20) and JML Universal Tonearm Alignment Protractor (\$3). With the one-piece Cart-A-

Lign template placed over the turntable spindle and properly lined-up with the tonearm pivot point, the user can accurately adjust the lateral angle of the cartridge in relation to the tonearm tube, set the correct stylus overhang, adjust the perpendicular angle of the stylus to the record as viewed from the front, and even set the proper anti-skating force. The Dennesen unit comes in four pieces but its use is easily mastered. It includes an adjustment for vertical tracking angle of the cartridge.

**Tape Care.** Obtaining clean, undistorted recordings from your tape deck requires two types of products: head cleaners and demagnetizers. The former category generally includes head cleaning fluid and various pads, elongated probes and mirrors for ease of operation within the constricted confines of the head assembly. Three products of this type are the Maxell Tape Recorder Care Kit (\$9); Calibron Master Care (\$9) and Bib Tape Head Cleaning Kit (\$15).

Head cleaning tapes in a standard cassette housing that you just pop into your deck are available from Osawa (\$8) and Allsop 3 (\$7) among others.

Devices designed to neutralize residual magnetism on your recorder's heads come in two styles: hand-held electric wands and units housed in a cassette shell. A particularly interesting wand from Calibron (\$20) features a built-in light so you can see what you're doing, and a unit available from Robins (\$14) has interchangeable tips for use on open reel, cassette and cartridge decks. TDK's self-contained electronic head demagnetizer in the form of a cassette has been the object of audiophile raves. The HD-01 (\$22) is inserted into a cassette deck as one would insert a normal tape cassette. With the deck switched to the "play" mode, residual tape head magnetization is neutralized in one second. The electronic circuitry contained in the transparent shell is powered by a self-contained battery. The Magicaire Cassette Demagnetizer from Recoton (\$10) is similar to the TDK product, but rather than being self-powered it's plugged into a standard electrical outlet.

**FM Antennas.** Devotees of FM have long had to contend with the antenna dilemma. Until recently, there were two choices. You either had to make do with the long, floppy, folded dipole wire supplied with your tuner or shell out some big bucks for a rooftop job. Now, however, a new breed of indoor antenna specifically designed for FM is carving a substantial niche in the marketplace.

The ball started rolling about three years ago when B.I.C. introduced the

Beam Box, an electronically directable device that looked like an audio component, not an antenna. Now available in three models, the Beam Box is equipped with passive electronic circuits that direct their sensitivity patterns toward any one of four quadrants at the turn of a switch. The unit itself need never be turned or shifted for optimum reception. The FM-10 (\$90) is designed for weak signal areas; the FM-8 (\$50) should satisfy listeners closer to the transmitter who want to improve their reception; and the new FM-6 (\$30) is a basic unit for squeezing that last ounce of good reception from strong signal areas.

The Winegard Company offers two indoor FM antennas. The FM-4400 (\$72) has a built in solid state amplifier which the company claims boosts and cleans up weak signals. There's a bit of controversy within the audio industry over the use of amplifiers in FM antennas. Some feel that noise, in addition to signal, may be amplified. The FM-4400 seems to circumvent the problem by including a switch to deactivate the amplifier if a noisy signal is encountered. Or, you can opt for the FM-2400 (\$40) with no amplifier. A signal arm on both units may be rotated 90 degrees in two directions for optimum reception.

Technics has just jumped into the indoor FM antenna race with its model SH-F101 Wing antenna (\$80), which is designed for listeners in strong signal areas. A knob tunes the antenna circuits for optimum reception.

Owners of FM tuners purchased more than five years ago have no means to decode Dolbyized signals being broadcast by many FM stations to reduce noise and increase headroom. Proper circuitry is built into most newer tuners. Integrex is now offering an add-on Dolby decoder, model DFM (\$100), which when hooked up to your tuner and calibrated using the broadcast Dolby test tone, will bring in all of the tonal quality that the station is sending your way.

Thingamajigs, Misc. No area of accessories is more fascinating than the category that enhances the enjoyment of your total system. In many cases, the products labelled "miscellaneous" broaden your system's capabilities and increase the quality of its sound at minimal cost. Here's a brief rundown of some of the more interesting products we've seen.

- **Russound VS-1 Remote Volume Control**—This little gadget is a near absolute necessity for anyone who has a second set of speakers up-stairs, away from their receiver or amplifier. It enables you to adjust the volume on the spot rather than having to run up and down to the main volume control. The device includes a rotary volume control, speaker-headphone switch, a remote headphone jack and an on/off/power attenuator switch that can be activated when the power rating (150 watts per channel) is approached or when you're using headphones with a high power source (\$80).

- **Littlites**—These highly flexible gooseneck lamps from Custom Audio Electronics feature a bayonet type bulb and a 360 degree swivel base. They're compact, attach easily to any surface and illuminate to any degree by means of a dimmer control. (From \$35 depending on size and features)

- **Robac Acoustic Panels**—These foot square panels made of sound absorbing material can turn your sound room into an acoustically perfect environment when properly placed on various parts of the walls and/or ceilings. The manufacturer claims they can eliminate ringing, echo and reverberation. Many cases require only an area the size of a large wall mural to solve the problem. The firm offers a device to help you calculate the number and placement of panels for your particular listening room. (\$9 per panel)

- **Ace Audio Filter 4000**—Frequencies below 20Hz contain very little music information, but lots of subsonic noise that can be triggered by speaker vibration, turntable rumble, record warp and sudden bursts of tone from dropping the stylus on a disc. This filter, when plugged into your tape monitor jacks, cuts all sound below 20 Hz at the rate of 18 db per octave. If your system is plagued by any of the above gremlins, this device should result in cleaner sound. (\$93)

- **Speaker-Uppers**—No, these are not people who talk louder or pills to make your speakers energetic. They're little stands on which to place your floor-standing speakers. Speakers located directly on the floor often produce a booming, distorted bass, and booming downstairs neighbors who may try to distort your face. Speaker-Uppers come in three types: Wood, adjustable, 7-inch lift (\$25 per pair); Tubular steel,

10-inch lift (\$60 per pair); Tubular steel with casters, 12-inch lift (\$70 per pair).

- **Monster Cable**—(Monster Cable Co.) and **Smog Lifters II** (Discwasher) are designed to replace the electrical cord you've always used to connect your speakers to your amplifier. If you figure they've always sounded just fine with electrical cord, it's only because you've had nothing for comparison. These low capacitance, low inductance, low resistance cables get high marks for increased clarity and definition, even with low power amplifiers or receivers. (Monster Cable, from \$25 depending on length; Smog Lifters, from \$10)

- **Rhoades Teledapter TE-200**—You have three choices when it comes to television audio. You can continue to listen to the shrill noise coming from the TV set's tiny, tinny speaker; you can spend a couple of hundred bucks for a component quality tuner that functions like your system's FM tuner; or, you can compromise with this little box that redirects the sound from your TV set to your audio system through the auxiliary input on your amplifier or receiver. The sound quality coming from your hi-fi speakers is much better with the TE-200 than without it, but nowhere near as good as with the big buck component tuner. This unit contains matrix circuitry for a simulated stereo effect. (\$30)

- **The Controller** by Audiotex—This handy little gadget allows you to connect up to five pairs of speakers to your system, and play any combination of them at once. Built in circuitry protects the amplifier regardless of how many speakers are activated. Two headphone jacks are also provided. (\$50)

- **The Director** by Audiotex—Plug this unit into your amplifier's tape monitor circuits and voila! you now have two extra auxiliary inputs, two tape monitor circuits, tape-to-tape dubbing capability and an input for an equalizer or third tape monitor . . . all at the push of a button. (\$40)

Let's see now, did we forget anything? Of course we did:

- **Hi-Fi Record Cleaning Cloth** (with serrated edges)—Model CL-55 hi-fi record cleaning cloth is a heavy duty product treated with silicone. It's available from Le-Bo or near the cash register of your favorite record store. (\$1)

## AUDIO PROFILE: DBX 224

dB level, more dynamics fit onto the tape, theoretically twice as much. Tape and disc limitations mean that the reality is short of the 100% ideal, but by

very little.

The dbx 224 has only three adjustments. They are rear panel controls that can be turned by a screwdriver.

They adjust *tape record*, *tape play*, and *disc play* levels. Once set for the deck or amplifier involved, they don't change. Incidentally, these adjustments

can be done entirely by ear, though use of a meter helps with the *tape record* control. On the front, three pushbuttons encompass a disc playback decode function, simultaneous tape encode/decode, and a bypass which shunts the signal through untouched.

At \$275, the 224 is the least expensive of NR separates I mentioned earlier. Dolby HX, a distortion reducing headroom expander aimed primarily at high frequency performance in cassettes, is an added function that joins other Dolby circuitry within a tape deck so it cannot be compared with the separate NR components. The Nakamichi High Com II is an encoding and decoding device with adjustable level, complex compression related to different frequency bands, and variable NR calibration. It is significantly more costly than the Sanyo and the dbx 224, offering either record/encode or playback/decode functions. Monitoring a signal being encoded requires a second High Com unit. The Sanyo Plus Series Model N-55 Super-D appears to be designed with the cassette in mind more than the open reel deck. It has a pre-set calibration tone and the potential—with experimentation—to set encoded recording levels for various widely different tape formulations and biases. Both the Nakamichi and Sanyo, like the dbx, allow significant dynamic ranges to be recovered from encoded tape storage, except that they offer more adjustment than dbx. Dolby NR is available primarily as a built-in feature of many tape recorders, factory adjusted to be used in conjunction with a Dolby calibrating tone for 0 dB on the meter.

The simplicity of the dbx system is attractive, especially at the relative price. Its dual disc/tape capability invites creation of a library of recorded performances in both formats, helped on by the well over 100 records that are already available. The already high level of interest in them should mean that audio and record retailers will have delectable stocks of dbx encoded discs well before Christmas. The attached box gives more information on available discs.

#### Field Test

The first test was admittedly the unfair one. That is, it would have been unfair to second-rate equipment. I inserted the 224 between an excellent pair of AKG condenser mics and a top-flight Revox open-reel deck. The scene of the test was a weekend afternoon concert in a large church. Organ, brass, and a heavy-caliber battery of percussion gave me every kind of high-impact, high-decibel, prolonged high-level

signal possible; also, the very softest stops of the large organ made for extremely low-level signals with significant high frequency content.

Good tape and 15 ips guaranteed that any oddities coming over the monitor were likely to be the dbx encode/decode process in action. In the true pioneering spirit, I recorded one segment of music four times. Once each with the levels set too high, too low, according to the (excellent) dbx manual, and according to my ear. In all cases, I got what I deserved. Considering the softness of the quiet portions of solo organ works, I got close to dead silence in back of the music, even when I under-recorded by normally disastrous margins.

Expectably, hot-lining the meters, with the red overload light on and off, I turned out both bass and treble distortion of an unpleasant kind. Remember, the 1:2 expansion at decoding doubles any distortion at levels above 0 dB on the meter. At both settings that were "right"—by the manual and by ear; very close to each other, in fact—the results were overwhelming. The small monitor/playback amp I had along for the recording balked at the stunning dynamics the decoded signal if volume got anywhere near realistic levels. With the dbx system, dynamics are real, not apparent, so sheer loudness by normal standards isn't necessarily the same as the impact of high-volume playback. I got the impression that the fine little Allison 5 speakers used for the location playback had never had such a juicy signal.

Sound quality was good to stunning. Bass and extended massed passages by the brass stood out in their realism. Just the tiniest darkening of the low end, as compared to the live sound and an unencoded dub of an identical musical passage, stuck out. Slight lowering of the recording level improved this slightly without causing it to disappear.

Home use of the 224 involved sampling dbx discs and using it to tape from normal discs, FM broadcasts by a sonically superior concert music station, and trying out the many wrinkles in the 224's utilization suggested by the manual.

Generally, performance was excellent. On some encoded discs, the heaviness and exaggerated weight of the bass I had heard at the live taping was apparent. FM signals of middling to mediocre quality were listenable, but had certain of their weaknesses magnified after dbx-ing, especially in high-level passages. Because rock and jazz tend to remain within more limited dynamic ranges than chamber and sym-

phonic music, I found that recording and playing them back took almost no level fiddling. The larger the dynamic range, the more careful must be the efforts to fit between minimum and maximum levels. In no case did dbx-ing of a clean signal result in unclear or unmusical sound at the other end of the process, unless I used lousy tape and/or a poor recorder. As a matter of fact, I coupled a cheap stereo deck with some well-known low-end cassettes and got some of the most interestingly garbled hash in the history of sound. Murphy's Law applies in spades (at that decoding ratio of 1:2) if you attempt to marry low-fi components to the encoding end of the dbx 224.

Non-linearities (lack of flat response) in the components surrounding the dbx 224 may or may not show up, but will tend to be twice as noticeable if they do. Be warned that this superbly engineered unit—like all NR systems—is no remedy for equipment unable to meet the considerable challenges of contemporary high fidelity.

It's the stuff you don't hear—tape hiss, record grumble, or scratches well below the 0 dB mark—that helps the dbx system to sound so vastly superior to "the old way." Its two functions, noise reduction, and dynamic expansion from the relatively cramped storage medium of tape or disc, are complementary to each other. When you try out the dbx Type II units, remember to listen to the very quiet passages, even the bands between selections, to truly savor the difference.

The owner's manual explains, simply and most thoroughly, the many possible functions of the 224, from playback of tape or disc (encoded) to copying tapes and discs (dbx and otherwise), plus various monitoring and simultaneous playback/record setups, using combinations of dbx and non-dbx functions. Good schematics make the phono plug connections pretty klutz-proof.

Some statistics: effective NR, 30 dB, plus 10 dB added headroom; dynamic range, based on the distance from weighted background noise to peak, 110 dB; THD, <.5% between 30 and 100 Hz; <.1% between 100 Hz and 20 kHz, (for the encode/decode cycle); IMD, <.2%; AC power consumption, 7 watts. No on/off switch is provided; the unit may be left on without damage, or plugged into an amplifier's or receiver's "switched" receptacle. The case is enameled black metal on top and in front, with solid walnut sides. Dimensions (independent of the rear-panel phono plugs used for connection) are 17½ inches wide by 1½ inches high by 6½ inches deep. ▲

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with but a single disc on Deutsche Grammophon, for about three decades. It therefore came as a bit of a surprise to find them associated with Angel-EMI, and a welcome one at that. The Philips engineering in recent years has been outstandingly good, a bit bass-heavy perhaps, but generally quite representative of the luxurious sound of

this orchestra playing in their own hall, unquestionably one of the finest concert halls in the world. EMI's engineers have done a fine job; a different approach perhaps, with a splendidly rich orchestral sound and luminous string tone. A disappointment here is the spotlighting of the two soloists, both of whom are overly prominent. This

does offer the listener an opportunity to feast on the marvelous sounds produced by Perlman and Rostropovich, but it would have been more effective if they were not quite so close. The performance itself is majestic, easily among the preferred currently available recordings of the music, even though it does not have a filler. ▲

WHAT'S NEW FOR '81

(Continued from page 41)

moderately high efficiency.

A second French entrant was Cabasse with two deluxe systems priced at \$1,000 and \$1,500 each. The firm has been able to project a high quality, high technology image because "every component part—even the glues and

varnishes we use, are Cabasse."

The third European entrant was KM Laboratories of Belgium, which debuted two deluxe amplified bookshelf speakers, and a larger floor model disco monitor, with bi-amping. The "motional feedback" book-shelf models sell

for \$1,390 and \$990 per pair.

Another spot of news was the re-entry of ADC—Audio Dynamics Corp., into the speaker market. It introduced a self-powered sub-woofer system priced at \$599. ADC also showed a crossover module for use with the subwoofer at \$99, and two compact speaker systems. One is the truncated-pyramid-shaped MS650 two-way at \$145 each, and the Cizek-designed B410, two-way at \$195 each.

Lux, noted mainly as a supplier of high quality audio electronics, also entered the U.S. speaker field with a compact two-way system at \$220 featuring "Aramid Fiber," a special mesh of multiple plastics, chemically heat treated.

ACR Industries, apparent newcomer to The Show, introduced an item that may be the answer for buffs wanting to improve the high end response of their systems. It is the R-T, a ribbon tweeter module that sells for \$100 and is used in conjunction with existing speaker systems deficient in upper mid-range and high frequencies. The 6-inch cube-shaped unit has switchable crossover circuitry built in.

Demonstrating new technology at The Show was Cerwin-Vega, which offered the SR-2 "Studio Reference Transducer," said to be "digital ready"—able to handle the wide dynamic range of digital and direct-disc recordings. Using an 18-inch high-excursion woofer, the system features a patented 12-inch mid-axial composite transducer with a time coincident compression driver-horn/acoustic filter arrangement. The latter is actually a kind of perforated cone that isolates the high frequencies, to prevent interaction and subsequent distortion between the two drivers. It sells for \$3,400 per pair.

Since the speaker industry has wised up to the fact that consumers are skeptical of so-called "breakthroughs" touted by various companies, it has settled down to improving the technology in more credible, incremental ways. One

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HFND-80

is the use of new cone materials. KLH, for example, debuted two new models (150 \$380/pair and 160 \$250/pair) with specially formulated polypropylene cones for greater efficiency, clarity and definition, a cone material previously used in its three higher-priced computer-controlled systems that are spurring other manufacturers to design new compact systems with better bass performance.

Altec Lansing, in making its products more affordable to the average audio buff, came out with three mid-sized systems (Models 4, 6, 8) all featuring Manta-Ray horn and Tangerine radial phase plug for better dispersed high frequencies. They also incorporate LZT—lead zirconate titanate, a space-age semiconductor material that directly converts electrical energy into physical motion. It makes possible a

compression driver small and economical enough for mid-sized speaker systems. The three units are forerunners of similar models in smaller sizes, at even more affordable prices.

Onkyo in its new speaker offerings is featuring "Direct-Drive-Membrane"™ tweeters, made of "extremely thin and pliable material called polyamide. The polyamide membrane is printed with conductive material forming an analogous voice coil on the flat plane of the membrane."

Hitachi offered metal cones in a three-way model at \$200—the lowest price at which the firm has sold metal cone systems.

Ultra wide frequencies of up to 50 kHz were a key reason for U.S. Pioneer to use newly developed polymer graphite cones in its new HPM Series of loudspeakers. Such cones are used in

the midrange drivers, along with high polymer film supertweeters. The three news systems range from \$195 to \$375 each.

Micros and More. To delineate the new component offerings in micro-sized form, models with remote control capabilities, and one-brand total audio component systems is beyond the scope (and allotted space) of this article. Relative to micros, check the Aiwa, Akai, Fisher and Rotel lines for new additions. New remote controlled audio systems bowed in the JVC, Kenwood, Sony, Technics and Toshiba lines. New individual remote controllable audio products were introduced by Aiwa, BSR, Optonica, Fisher, Dual and Tandberg, among others. As for new one-brand systems, they appeared in the Sansui, Kenwood, JVC, Hitachi, Philips and Rotel brands. ▲

## SPOTLIGHT ON: PHILIPS N5781

(Continued from page 30)

recording the tape will advance to the programmed counter reading and then stop.

The Radio Frequency Interference suppressor is unique, and a valuable feature for anyone who records from AM broadcast and short-wave band receivers. On certain frequencies the harmonics from the recorder's bias oscillator "beat" against the received signal, causing "birdies" or "whistles" as a background to the received signal. A switch on the back of the recorder shifts the bias oscillator frequency slightly, just enough to eliminate interference to the received signal. There is no "proper" position for the switch, the setting that eliminates the "birdies" is

the right setting. Though changing the oscillator frequency has a very slight effect on the recorded sound above 10 kHz, it's in the order of a nominal 3 dB variation at 15 kHz. Best bet, if you use the filter, is to determine the position of the RFI switch that works for you and then calibrate the machine to the tape.

The setting of the RFI switch has no effect on normal recording; you can use either setting as long as you make the sensitivity/bias adjustments for the particular RFI switch adjustment.

The pitch control's range is unusually broad, measuring +10/-12%. It functions only for playback—recordings are at "standard" speed regardless of

the adjustment of the pitch control—and has a detent for standard speed. While it will generally serve no purpose in typical use, it will prove invaluable to musicians and students who "play" along with prerecorded tapes as it allows the pitch of the taped program to be matched to that of the instrument.

But features aside, the real news on the Philips N5781 deck is the sound quality. As we said earlier, it can be spectacular, particularly if metal tape is used. Even at the \$569 list price it's a great value.

For additional information circle No. 95 on the reader's service coupon. ▲

## SOUND PROBE: INFINITY RS<sub>a</sub>

(Continued from page 24)

them, the high frequency driver has to be accurate and capable of fairly wide dispersion of the sound it pours out. This is exactly what the new tweeter does—and superbly. The EMIT—electromechanical-induction-tweeter—looks like no other such unit we've ever seen.

Physically, it bears some resemblance to electrostatic drivers. It's not an electrostatic, though—the audio signal from the amp gives it all the polarizing current it needs, so there's no power pack to charge electrostatic plates. Two parallel rows of slits in a black metal plate let us look into the EMIT, where we see tiny rows of silvery sound generators. Where most tweeters have a dome—or cone—and a voice coil centered on a magnet, the thin metallized film in this little unit has its "wiring" (if we may misuse the term this time) etched onto it. Very low moving mass and a

large, evenly chargeable surface are the delightful result. Some other new Infinity models use this same tweeter and a similarly designed midrange driver that, logically enough, they call the EMIM.

By its design, the EMIT intentionally disperses the sound more broadly in the horizontal plane than vertically. As the speaker arrives from the manufacturer, the EMIT is oriented to provide optimum high frequency spread in the vertical position. "Wonderful," we said. Now how does the speaker sound if you lay it on its side, as many listeners do in their homes? Infinity equipped the EMIT with four small hex screws around its metal edge which come out easily for removal of the whole unit. If you rotate it 90 degrees on its seat and refasten the screws, it is oriented just right for proper horizontal dispersion. The operation for both speakers of a

stereo pair is simple and takes just minutes.

The RS<sub>a</sub> has knob controls for adjusting the high and middle frequencies. They are uncalibrated and simply indicate + and - positions for the trimming of the speaker's curve. We found them inconvenient to get at with the speaker set up for listening, as they are sunk in the rear-panel well that houses the push-to-release wire terminals and replaceable fuse.

Infinity claims on-axis frequency response within ±3 dB between 45 Hz and 32 kHz . . . which goes well above what the ear can hear. Normal hearing for someone with good perception of tonal subtleties stops an octave below that, at around 16 kHz. Crossover between the woofer and the EMIT is at 3 kHz.

We feel Infinity's recommended minimum driving power of 25 watts is

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realistic and wise. A high-performance speaker, even if played at fairly low levels, needs the kind of headroom that avoids cramping the louder attacks and prolonged notes of music. The speaker will handle a maximum of 150 watts rms. Nominal impedance is 4 ohms.

Both the RS<sub>a</sub> and its three-way brother, the RS<sub>b</sub>—it features the EMIT and EMIM—have a five year warranty transferable to successive owners. A warranty this long and straightforward is ample proof of Infinity's belief in what it makes.

## Performance

Performance is the word, all right. Thanks to the EMIT, the stereo imaging of the RS<sub>a</sub> is a clear, very specific, and remarkably lifelike. We have no laboratory measurements of off-axis treble response, but the open and pure sound of the highs anywhere in the room—even at the back—caused us to really enjoy pinpointing various instruments in some favorite recordings. Establishing spatial relationships with enviable ease, the pair of RS<sub>a</sub>s put kettledrums, clarinets, Carole King, and a sprightly hammered dulcimer where we could almost visualize them.

The quality of the sound was always musical and within the bounds of truly natural tonal beauty. Stridency and crackling never trespassed on what became an increasingly pleasant experience as we listened on into the night.

Our only reservation, and a small one at that, is that the upper mid-range

appeared slightly forward in most recordings we tried out. This meant that there was a gripping immediacy in almost all the rock and jazz we played. Lean textured music, such as some folk and guitar performances benefited nicely from this. But in symphonic or chamber music we found that the slight tendency to "push" this, the high middle region of the audible spectrum, at us became somewhat distracting. To restore the balance, it sufficed to carefully match the speaker's own knob settings and the ones at the amplifier to level things off to our satisfaction.

Take the time to position loudspeakers well—the small effort involved eliminates many potentially disturbing notes that get emphasized out of proportion to the others. After the short interval spent arriving at placement for the RS<sub>a</sub> pair, we were astounded at the very beautiful bass. Even massed groups of the low instruments of the orchestra maintained their separate characters and clarity. No clutter, no boom, and plenty of good, deep bass in the right spots came rolling out at our command.

All in all, this natural and exceptionally honest loudspeaker takes good recordings and fills your listening room with a polished, vivid sound image of the music event captured by the recording engineer. We found the slight prominence of the high midrange no obstacle to achieving a thoroughly enjoyable and, as we said, musical sound. ▲

## SPOTLIGHT ON: MITSUBISHI LT-5V

(Continued from page 22)

what's in a "hundred" different high fidelity turntables.

As you would imagine there are a lot of somewhat critical tolerances when it comes to setting the overhang and stylus position so that you can enjoy the benefits of this design. The whole problem is resolved with a notably excellent combination overhang/stylus-position gauge that leaves no room for guesswork; both "high" and "low" limits for the stylus position are engraved on the gauge. It's a beautiful set-up procedure; time consuming, but not difficult. The only problem is that Mitsubishi provides only two sizes of pickup mounting screws, neither of which were correct for many popular U.S. pickups. You might have to dig up the hardware that came with your pickup.

The tonearm is driven across the platter on a steel rail. Optical sensors determine when the tonearm has been insignificantly shifted from true vertical, and apply power to a motor that corrects the tonearm to true vertical. More or less this is the same system used in most modern linear tracking

turntables. It's essentially foolproof. The difference in the LT-5V is that the mechanism appears to have no weaknesses—it looks like a piece of machinery made to impress the boss.

At \$450 the LT-5V is lowest priced linear tracking turntable now in production and as such is a real bargain. But, let's be honest, just about any \$450 turntable is likely to be pretty good. On the other hand, the LT-5V is better than many far more expensive machines. Differences in sound quality become apparent at the inner record diameters, particularly if the grooves were cut closer to the lable because the extra time was needed. The vertical tracking of the LT-5V delivers lower distortion from the inner grooves.

The really big difference, on a dollar-for-dollar basis, comes from the vertical orientation. External shock and vibration is now in the same plane as the pickup, rather than at right angles, and the player can literally vibrate on a table with a short leg and the stylus will stay in the groove. It takes a direct strike on the player itself, and a rather



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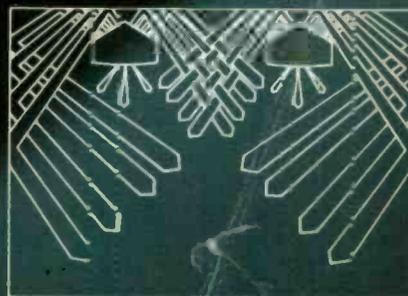
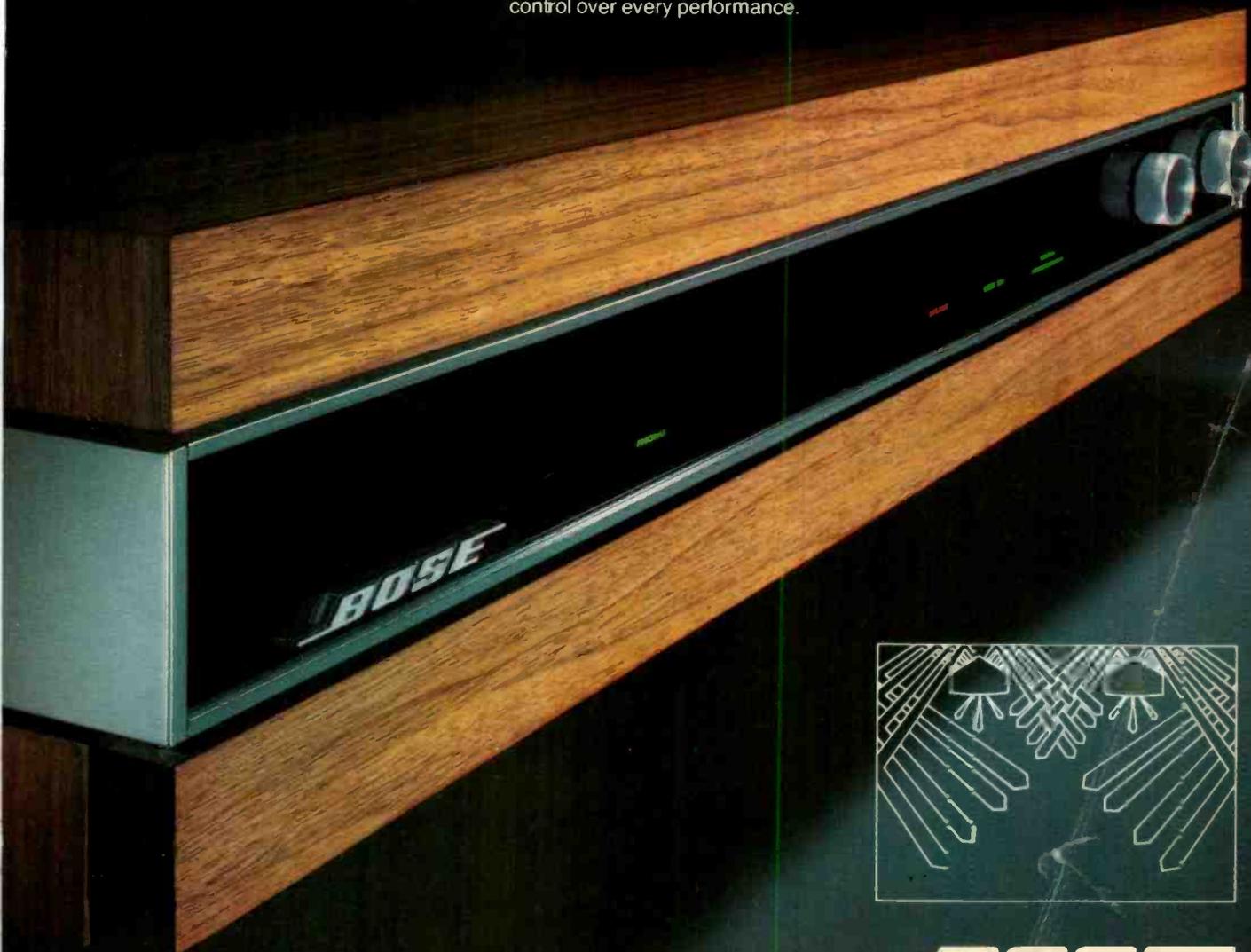
Here's how Ralph Neill of *Australian Hi-Fi* described it:

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