

**BUYING BASICS**

SEPTEMBER-OCTOBER 1979 \$1.35

# hi-fi stereo

## BUYERS' GUIDE

### **TURNTABLES & CARTRIDGES**

HOW TO COME UP WITH A WELL-MATCHED TWOSOME

**FALL FORECAST '79**  
A LOOK AT WHAT'S NEW NOW

**SPOTLIGHTS ON:**  
HITACHI D-5500 CASSETTE DECK  
YAMAHA T-1 TUNER

**CAR TAPE TIPS**  
CUSTOMIZE YOUR RECORDINGS  
FOR PLAYBACK IN THE CAR

**TEST REPORTS**  
FROM OUR INDEPENDENT  
TESTING LABORATORY



NO2FPLE1380 AP-0 01 169NDV79  
FRED D'AMOUR  
38 PLEASANT ST  
BURN ME 04210



**The first high-technology record cleaner was the Discwasher System. Four scientific revisions later, the Discwasher is literally years ahead of all other devices.**

**WITH PRIORITY TECHNOLOGY:**

Discwasher D3 Fluid is proven by lab tests to be the safest active cleaning fluid for record care. But a good fluid is not enough. The Discwasher System is also a *precision removal system* that uses capillary action with slanted micro-fibers to lift dust, dirt, and dissolved debris off the record, rather than pushing them around like "dry" and "constant humidity" methods. The real dimensions of record care are safety plus integrated function.

**WITH PROVEN VALUE:**

The uniquely styled Discwasher handle is constructed of hand-rubbed walnut which will long outlast "plastic wonders". This easily held handle is lightweight because of an integral cavity which conveniently holds the D3 Fluid bottle. A special brush to clean the directional-fiber Discwasher pad is included without charge, and also fits inside the handle cavity.

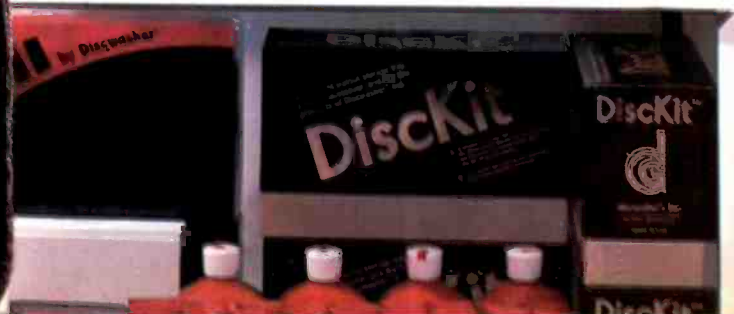
**WITH GENUINE SATISFACTION:**

Only Discwasher gives immediate performance, long-term record safety, pleasing physical characteristics and a price that hasn't changed in five years.

Seek out the Discwasher System, by name. Only Discwasher delivers technology, value and satisfaction.

A man in a dark suit and light shirt is shown in profile, looking towards a display of Discwasher products. The display includes a stack of DiscKit boxes, a bottle of D3 fluid, and a Discwasher unit. The background is a plain, light color.

## YOUR RECORDS DESERVE SUPERIOR CARE: SEEK OUT THE DISCWASHER® SYSTEM



 discwasher, inc.  
Columbia, MO 65201

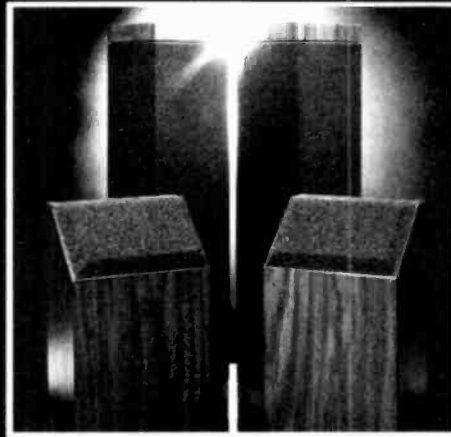
Audio Pulse Digital Time Delay is possibly the greatest advance in sound reproduction since stereo. A strong statement indeed, but we feel strongly about it. By means of time delay, the ambience of the live performance is returned to the music in a way not possible with ordinary stereo reproduction.

Stereo gave us left and right imaging — Audio Pulse gives us the realism of depth and spatial perception by digitally processing, delaying and recirculating

program material through a secondary set of rear speakers. The apparent size and acoustic treatment of that area can be adjusted by simple front-panel functions.

Digital time delay must really be heard to be appreciated... but once you do, you won't want to listen without it.

Audio Pulse offers complete digital time delay systems. Model Two, the new Model 1000 and two sets of specially designed secondary speakers.

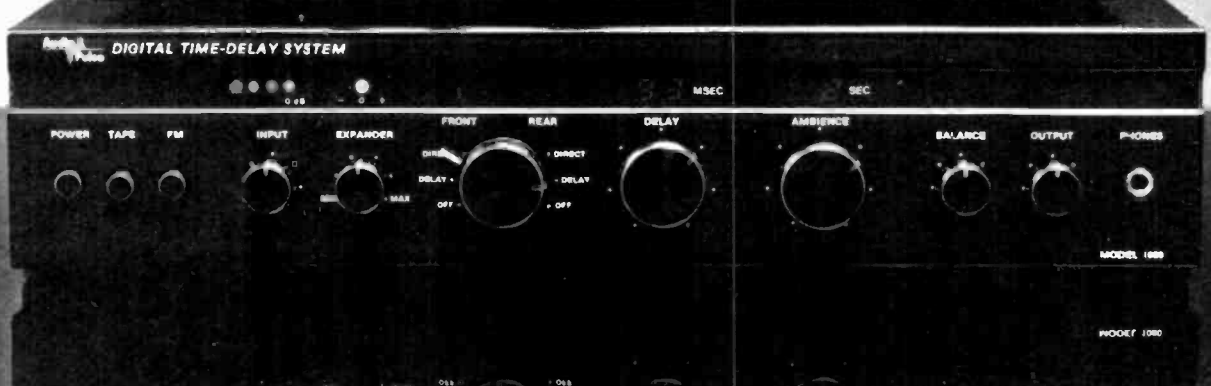


## Audio Pulse

YOU WON'T MISS IT UNTIL IT'S GONE...

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# Why Wait, Delay Now.



# hi-fi stereo

## BUYERS' GUIDE®

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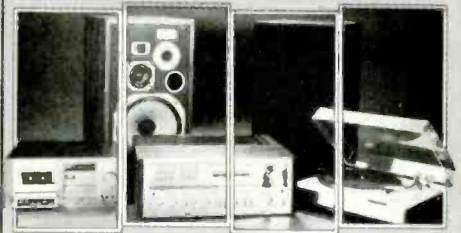
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Cover photo by Dave Niedo

Kennedy/Niedo Studio

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# Ohm's Law 8:

**Make loudspeakers with great pride, and they will get great reviews.**

Ohm defies the laws of modern loudspeaker production.

We don't mass-produce our speakers in huge quantities. Most of the elements that go into Ohm loudspeakers are so intricate, they must be made by hand.



The result is pride-of-craftsmanship you can hear.

Audio critics have heard it. As you're about to read...

#### **Complete Buyer's Guide to Stereo/Hifi:**

"The Ohm C2 is a high efficiency speaker with ruler-flat response to 37 Hz., high power-handling capability, very smooth



treble response, and excellent dispersion. Considering the size of the box, performance, and the price, the Ohm C2 must be reckoned with as one of the better speaker values available...Ohm speakers are very well made, and we recommend this model highly."

#### **Stereo Review:**

"Our standard live-room integrated frequency response measurement of the Ohm F produced one of the flattest extended curves we have ever seen from a loudspeaker...It should be apparent from the foregoing that we include the Ohm F among



those few speakers we have tested that achieves state-of-the-art performance." (Copyright 1973 by the Ziff-Davis Publishing Company. Reprinted from *Stereo Review*, October, 1973, by permission. All rights reserved.)

#### **Canadian Stereo Guide:**

"The Ohm E is just an ordinary speaker to look at.



But when you fire it up, it's something else again. Sound quality within the limits of its capability was well defined and well controlled, with no indication of mushiness even at the outer fringes of the spectrum. The Ohm E speaker system has an excellent dispersion pattern over its entire operating frequency range..."

#### **Complete Buyer's Guide to Stereo/Hifi:**

"The Ohm H manages to get prodigious bass response out of a small box without sacrificing efficiency. The high end is handled by conventional drivers and is everything one might ask from a speaker. Dispersion is excellent, and the overall sound quality is exemplary."

#### **Stereo Review:**

"In the simulated live-vs.-recorded test, the Ohm L proved to be a highly accurate reproducer of music...Its highs were strong, and even in our well damped listening room the

crispness imparted to vocal sibilants and instrumental sounds such as wire brushes and triangles could be plainly heard... The upper mid-range and high frequencies were virtually perfect." (Copyright 1977 by the Ziff-Davis Publishing Company. Reprinted from *Stereo Review*, June, 1977, by permission. All rights reserved.)

#### **Complete Buyer's Guide:**

"The Ohm F is an extraordinary loudspeaker. The coherent sound produced by this speaker is clear, full, and undistorted. It may well be the finest speaker on the market, and is certainly without a doubt among the top few."



For 13 complete reviews, and full specifications, please write us at: Ohm Acoustics Corp., 241 Taaffe Place, Brooklyn, N.Y. 11205.



**We make loudspeakers correctly.**

# HOW THE MODEL 100 BRINGS A WHOLE NEW FEELING TO YOUR MUSIC

In recent months, we've received rave comments from all kinds of music lovers about our new Model 100 Subharmonic Synthesizer. "I can't believe what sounds I've been missing;" "It adds fullness to the bass that you normally only hear and feel in a live concert;" "It adds presence and impact to disco music although I use it most of the time with classical records;" "I have a whole new record collection now;" and so on.

But besides these great comments, most new Model 100 owners also wanted to know just how it improves the low-frequency performance of their music systems. So, we're happy to oblige.

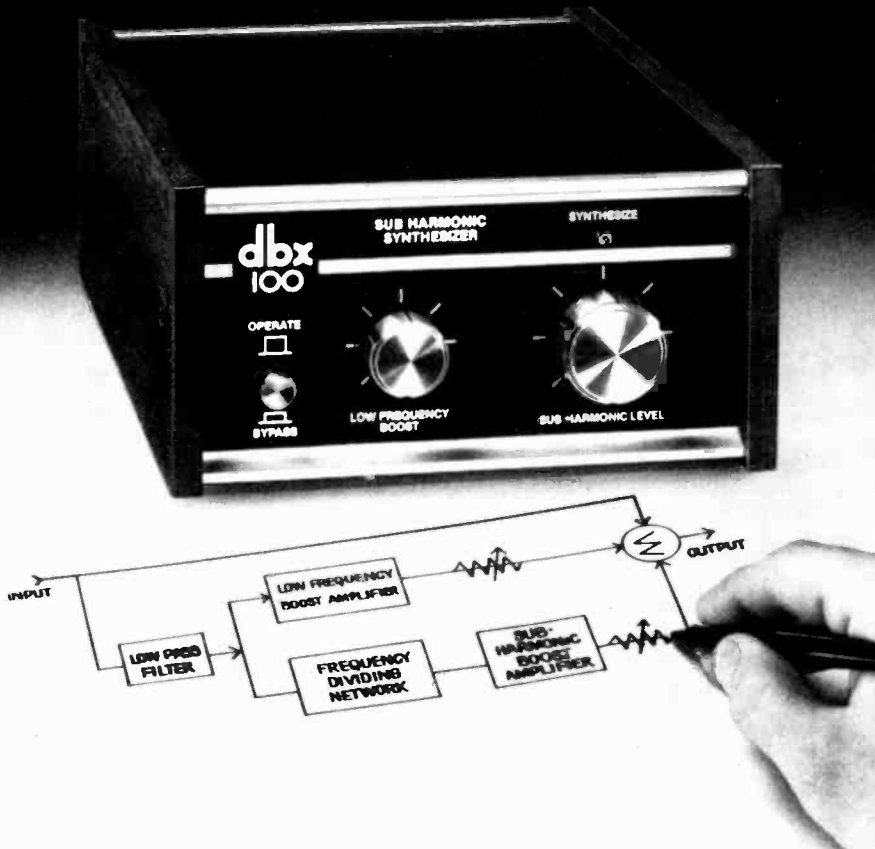
As the block diagram below shows, the music signal from your preamplifier (usually taken from the tape monitor output jacks) is fed directly into the Model 100. Its circuits send the full frequency range of this signal straight through. Simultaneously, the Model 100 selects the lowest notes in the signal (between 50 and 100 Hz), creates a companion signal an octave lower, and mixes it back with the original musical signal. A front panel control allows you to vary the level of the added subharmonic signal, and there's a special output for use with subwoofer systems too.

What happens is that you literally achieve a sense of "being there" —with more excitement from your music than ever before—no matter whether you're listening to disco, rock, or classical music.

Now that you know how the Model 100 works, we suggest that you experience the full impact of this unique electronic component at your dbx dealer. The dbx Model 100: just one of our keys to unlocking your ears.

dbx, Incorporated, 71 Chapel St., Newton, MA 02195, (617) 964-3210.

**dbx**  
UNLOCK  
YOUR EARS



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HI-FI/STEREO BUYERS' GUIDE

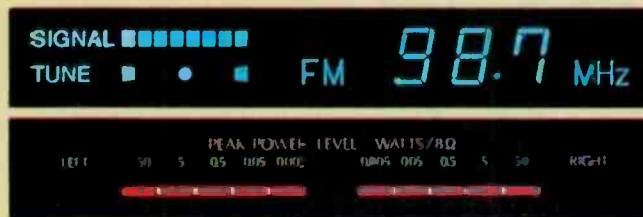
# The new Sansui G-4700.



## A double-digital receiver with all the right numbers.

Digital readouts and digital circuitry. Great specs. And the best price/performance ratio in the business. All the right numbers. That's the new Sansui G-4700. Just look what we offer:

**Double-Digital Design:** The front panel of the G-4700 has a bright electronic digital readout that shows the frequency of the station you've selected; and behind the front panel is one of the most advanced tuning systems in the world.



Sansui's patented Digitally Quartz-Locked Circuit uses a precise quartz crystal time base to keep your station locked in, even through many hours of listening or if you turn the receiver off and back on again.

Conventional quartz-controlled receivers use analog phase comparison circuits that can become inaccurate because of harmonic interference. Our system uses a new LSIC (Large Scale Integrated Circuit) digital processor that actually counts the vibrations of the quartz crystal to compare to the tuned frequency. The frequency is perfectly locked in the instant you find the station you want.

With this unique Digitally Quartz-Locked system, the G-4700 delivers high sensitivity (15dBf, mono); a better signal-to-noise ratio (75dB, mono);

and a better spurious rejection ratio (70dB).

**DC power amplifier:** Power is ample for almost any speaker made, with 50 watts per channel, min. RMS, both channels driven into 8 ohms from 20 to 20,000Hz with no more than 0.05% THD.

And the wide bandwidth DC power amp circuit responds quickly to transient music signals for the most accurate and pleasing music reproduction. What you hear is clean and sharp, just the way it was recorded.

**Electronic LED power meters:** Don't worry if your present speakers can't handle 50 watts. The array of fast-acting LED's (Light Emitting Diodes) on the Sansui G-4700 lets you monitor and control the output level so you don't damage your speakers.

**Electronic tuning meters:** Two fluorescent readouts help to zero-in on each station with accuracy and ease. Both the signal strength and center-tune indicators operate digitally for precise station selection, and the nearby LED verifies that the quartz circuit has locked in your station.

**Superb human engineering:** A full complement of genuinely useful knobs, switches and jacks gives you complete control over what you hear and how you hear it.

Ask your authorized Sansui dealer to demonstrate the G-4700. Listen to the music. You'll love what you hear. Look at the numbers. You'll love what you see.

### SANSUI ELECTRONICS CORP.

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Extend your listening distance with a *new* **FINCO... auto FM amplifier**



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**FINCO's self contained top of the line Auto FM Amplifier with variable gain control**

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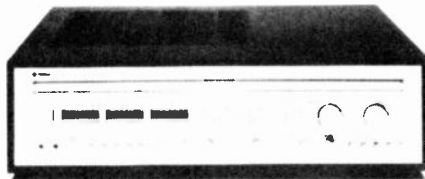
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(216) 232-6161

Circle No. 46 On Reader Service Card

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

### Top-of-the-Line Receiver

Yamaha's new, 120-watt-per-channel receiver, the Natural Sound CR-2040, provides AM and stereo FM reception that the company describes as "unprecedented." The power output into 8 ohms, from 20 to 20,000 Hz, has no more than 0.02% total harmonic distortion. A unique feature is said to be the citing of specifications based on actual in-use performance, not on lab tests of isolated sections taken one at a time. Yamaha's system, known as "Real Life Rated" and as NDCR (Noise and Distortion Clearance Range) measures tonal quality of all sections as they work together. The bass control has a variable range of 100 to 500 Hz, the treble from 2000



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to 8000 Hz, and presence from 100 to 5000 Hz. The precision phono equalizer of the unit has an S/N ratio of 95 dB, with harmonic distortion of 0.01% or less from 20 to 20,000 Hz. Accurate reproduction of phono records is assured by equalization with only  $\pm 0.2$  dB deviation from the standard RIAA curve. A four-position switch permits matching the load impedance to the cartridge of the user's choice: 33,47,68 or 100 ohms. The power amplifier's S/N ratio is an "impressive" 100 dB, harmonic distortion is 0.01% and the power bandwidth is from 10 to 50,000 Hz. There's complete blow-out protection for power transistors and speakers. The FM tuner section has a sensitivity of 1.6 microvolts and quieting sensitivity of 35 microvolts in stereo for 50 dB of quieting. This also results in heretofore "unachieved" resistance to RF interference. Price: \$860.

### New Generation Headphones

Sennheiser offers "new generation" headphones featuring improved magnet and sound-surround diaphragm design. Said to be "virtually distortion free," the headphones weighing only seven ounces provide audio frequency response from 16 to 20,000 Hz. Harmonic distortion is put at less than 0.5% (DIN 45 500). This performance is achieved by use of a new diaphragm design and of a more powerful magnet weighing one-third as much as those made of conventional materials. Model HD-430 is also the first Sennheiser headphone to combine an open air de-



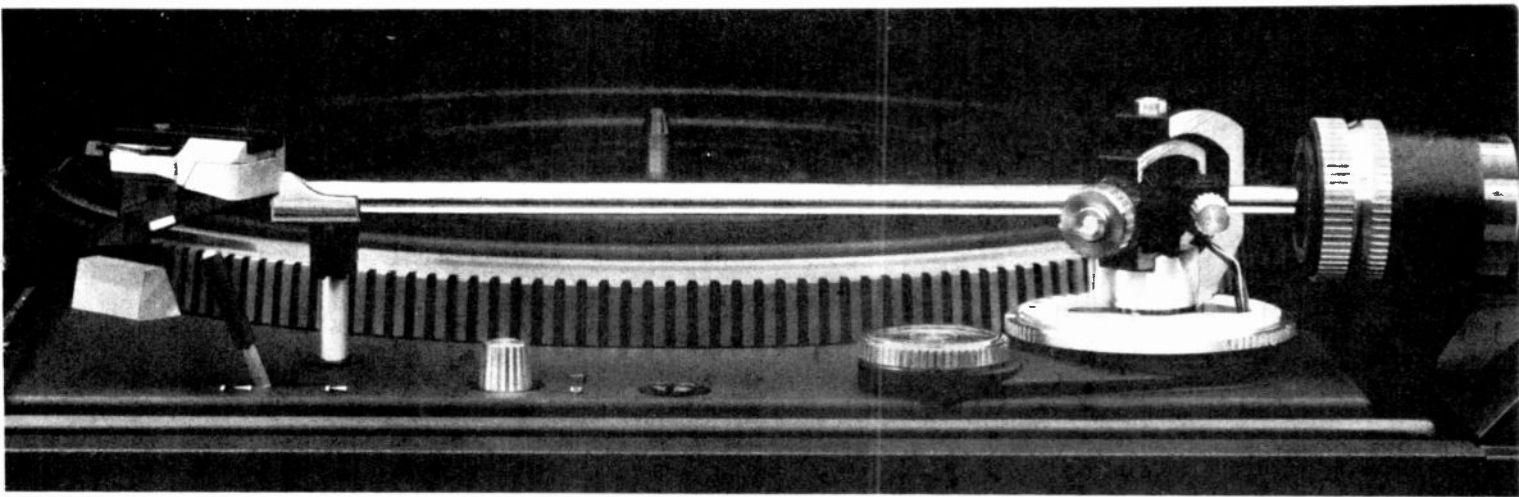
Circle No. 103 On Reader Service Card

sign with circumaural ear cushions which lightly surround the outer ear to separate the ear from direct contact with the inner foam pad and yet permit all the advantages of open-air listening. The headphone exerts a headband pressure of only about three Newtons which is an index of listener comfort. Typically, open air headphones have half the headband pressure of conventional closed headphones, says Sennheiser. Impedance is 600 ohms per channel, and sensitivity (nominal spl at 1 kHz) is 94 dB at 1 mW input. Comes with a 10-foot stranded-steel cable with stereo phone plug for \$119.

### Computer-Controlled Speaker System

KLIH claims to have reached the long-sought goal to produce compact speaker systems capable of reproducing deep bass with the accuracy of larger, more expensive systems. The achievement has come through invention of an entirely new electronic module, the "Analog Bass Computer," which is supplied with the speakers. The Bass Computer constantly "anticipates" the speaker cone motion by reading the output of the power amplifier, and instantaneously controls cone excursion in accordance with the readings. As a result, the speakers are protected against bass





## All your records will sound better with Dual's new ULM tonearm and cartridge system.

*Even if they look like this.*

Although none of your records may be in such bad shape, many are probably warped enough to present serious problems to conventional turntables.

The high inertia of a typical tonearm and cartridge combination, with approximately 18 grams total effective mass, causes the stylus to dig in riding up the warp and to take off on the way down. Tracking angle and tracking force vary widely—as much as 30 percent. And a warp as small as 1.5 mm (which is barely discernible) can generate harmonic distortion of 2.7 percent. That's audible!

These problems have now been solved by Dual's new Ultra Low Mass tonearm and cartridge system.

The potential for this solution has existed ever since the development of Dual's dynamically-balanced tonearm with its gyroscopic gimbal suspension and straight-line tubular design.

Dual's research into the effects of mass on record playback led to a collaboration with Ortofon. A cartridge was developed with substantially less mass than any in existence. It weighs just 2.5 grams, including mounting bracket and hardware.

At the same time, the mass of the Dual tonearm was further reduced so that a perfectly matched tonearm and cartridge system emerged. Its total effective mass is just 8 grams. That's less than half the mass of conventional tonearm and cartridge combinations.

Tracking a record with the same 1.5 mm warp, the ULM system reduces harmonic distortion to only 0.01 percent. That's 270 times less than that produced by the conventional tonearm and cartridge.

Not only is the overall sound audibly improved, but stylus and record life are significantly extended.

To experience the demonstrable advantages of ULM, bring a badly warped record to your Dual dealer. Listen to it played with the ULM tonearm and cartridge. (All nine new Dual turntables feature this system.)

You will hear the difference that ULM can make on all your records.

For the complete ULM story, please write to United Audio directly.

ULM.

A major breakthrough in record playback technology.

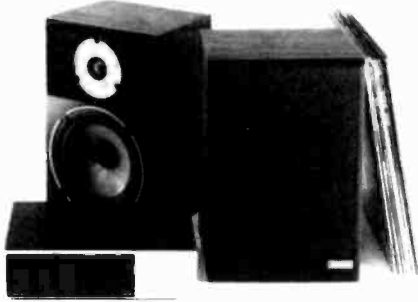


United Audio  
120 So. Columbus Avenue  
Mt. Vernon, New York 10553.

Write directly to Manufacturer for Literature.

# AUDIO SHOWCASE

overload, and are able to provide clean, distortion-free bass equal to that of units up to four times larger, according to the company. For example, the new KLH-3 is only a quarter cubic foot in size, yet produces bass flat to 40 Hz. This model uses a new 15 cm KLH woofer with polypropylene cone and



Circle No. 102 On Reader Service Card

cast basket, and a new 2.5 cm KLH tweeter. Acoustically absorbent foam on the front baffle reduces high frequency diffraction effects. It's suggested for use with receivers or amplifiers of 2 by 40 W to 2 by 200 W power.

Specs: sensitivity, 85 dB/1 watt at 1 meter, 1 kHz; -3 dB at 40 Hz at 95 dB spl (system in room). Price of the KLH-3 is \$420 for a stereo pair, complete with the Analog Bass Computer.

## Home Disco Equipment

It had to come! You can now buy a single package sound and light system to set up your own home disco. Meteor



Circle No. 104 On Reader Service Card

Light and Sound's Combo is a portable, full-function mixer, a high power amplifier, and a versatile three-channel lighting controller. Just add a turntable, loudspeakers and lighting of your choice to enjoy a full-scale pro-type disco installation. The mixer section provides two turntable inputs (switchable to line as required), DJ mike input, and stereo headphone output, all with individual slider volume controls. A cross-fade slider allows a smooth transition between the two turntables, and full headphone cueing permits precise set-

ting of the next record as another is playing. Other features include: rumble filter; talkover-the-music switch for the DJ; low-distortion amplifier design; meter and peak light for each channel. The lighting section gives complete control over three main channels of lighting, plus switchable accessory outlets for auxiliary lighting. The main lighting can be controlled automatically in either a sound-to-light or chase mode, or it can be switched to manual for DJ operation of the individual effects. In the progression mode, the speed of the chase can be set by the rate control, and the chase may be triggered either by the music or automatically. Suggested retail price: \$1,075.

## Upgraded Receiver Line

Philips' receivers, Models AH901 and AH903, are rated at 80 and 125 watts per channel continuous power across 20 to 20,000 Hz bandwidth, with no more than 0.05% total harmonic distortion and 0.03% THD respectively. The AH901 represents a "total departure in cosmetics" for Philips because the unit will be sold in brushed alumi-



Circle No. 84 On Reader Service Card

num only. Other features include two vertical power meters using fluorescent readout for each channel. A and B speaker positions, 20 dB af mute, external connections for Dolby, FM muting, two tape monitors and dubbing, and low filter. Also a loudness control, mike mixing volume control and jack, multiplex filter, LED tuning and center meter. Price: \$549.95. The more powerful AH903 (shown here) has all the same features plus digital FM tuning indicator and log scale, as well as a mid-range control along with bass and treble. The tag on the AH903: \$749.95.

## Three-Head Cassette Deck

TEAC's new A-430 three-head cassette deck has a three-tier auto-bias circuit which automatically determines the precise bias for any kind of tape, even if its characteristics are unknown. The revolutionary bias scanning system automatically adjusts to the recorded signal for normal, chrome or metal tape. You simply run your tape in the record mode, press the auto-bias button, and the machine does the rest. The bias

# HEADPHONES THAT PUT THE MOST EXPENSIVE SPEAKER SYSTEMS TO SHAME.

When you listen to Sony headphones, you'll share an intimacy with the music you've probably never experienced before; you'll hear subtleties you've missed with most speakers.

Admittedly, this may sound rather extraordinary. But then, so do our headphones.

## SONY

We've never put our name on anything that wasn't the best.



Circle No. 47 On Reader Service Card

# The Overachiever



## TDK's improved D gives you more performance for less money: take two home and save 25%\*

Some cassettes just aren't worth the money — even at half the price. Whether they're "bargain" cassettes that jam, flutter and distort. Or "premium" cassettes that charge premium prices for disappointing performance.

Finally, there's a cassette that gives you more than you paid for — TDK's improved D.

New improved D features a unique Hi-Grained Ferric Oxide particle developed by TDK's engineers, who have also incorporated many of the features of TDK's super precision mechanism.

Now, improved D gives you the performance some "premiums" only promise, at a modest price few "bargains" can match. Your music will sound great in any mid-priced home deck, car deck or portable.

That's because high frequency sensitivity has been improved by 2.5-4.0dB (from 10 kHz-16 kHz), yielding recordings with a wider dynamic range than any cassette in its price class. And maximum output level (MOL) has been increased by a substantial 3.0dB (at 10 kHz) to give you more recording headroom with less chance of distortion.

Best of all, improved D continues in the TDK tradition of quality, with a superior, precision mechanism that will provide years of ear-pleasing performance.

TDK cassettes are a bargain at any price, so why not take two D's home and discover the best bargain of all — TDK quality at a savings of 25%. TDK Electronics Corp., Garden City, New York 11530.

 **TDK**  
The machine for your machine

\*At participating dealers © 1979 TDK Electronics Corp

Circle No. 17 On Reader Service Card

# AUDIO SHOWCASE

level sweeps over its calibration range while the recorded signal from a built-in calibration oscillator is monitored from the tape. When the tape output reaches the ideal level, the bias level is locked in. The A-430 also features a servo-controlled DC motor, accurate peak level meters, Dolby, rec/mute editing mode,



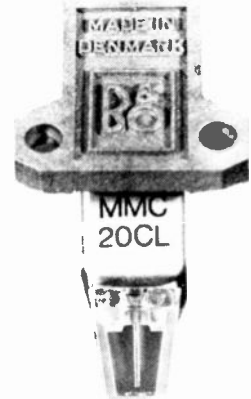
Circle No. 10 On Reader Service Card

memory rewind, a lighted cassette compartment and flywheel-damped eject system. Specs: wow and flutter, 0.07% WRMS; frequency response, with metal tape, 30 to 17,000 Hz; S/N ratio, 55 dB (with Dolby up to 5 dB at 1 kHz, and 10 dB over 5 kHz). The unit also has two line inputs, two line outputs,

two mic inputs and a stereo headphone jack. The buying price: \$500.

## Pick-up Cartridge

Bang & Olufsen's MMC 20CL pick-up cartridge is of single-crystal sapphire cantilever design that creates a stylus assembly so rigid that the mechanical transfer function is as close to unity as possible. Bonded to the sapphire cantilever is a nude, multi-radial contact line diamond stylus. ETM is 0.3 mg,



Circle No. 105 On Reader Service Card

and frequency response is 20 to 20,000 Hz  $\pm$  1 dB. The cartridge weighs only 4 grams, and has a Moving Micro Cross armature to provide "excellent" stereo separation. A permalloy shield encloses the entire magnetic circuit, to avoid interference from external fields and to virtually eliminate hum. A see-through guard not only protects the stylus from accidental damage, but also permits accurate cueing and easier spotting of dust accumulation. Every cartridge is computer tested and the measured results are included with them. Suggested retail price: \$200.

## Floor Standing Loudspeaker

Thiel's Model 04 floor standing loudspeaker boasts highly accurate phase



Circle No. 106 On Reader Service Card

and amplitude response. The wide  
(Continued on page 18)



## Clean look, clean sound.

The Crown *Power Line One* amp and the *Straight Line One* pre-amp are designed for people who delight in accurate sound reproduction, whose joy is in listening and for whom simplicity of operation is important. They are obviously easy to operate, yet all the basic controls you need for accurate reproduction and monitoring of fine quality sound are there.

Your greatest enjoyment will surely come from the unusual sonic accuracy of these units. Frequency response  $\pm$  0.1 dB, 20 Hz-20 KHz on both units. IM distortion below .001% on both.

Signal to noise down a phenomenal 110 dB on the amp. Both units are acoustically as transparent as can be imagined.

Achieving that purity of sound and function wasn't simple. We've had years of experience in building state-of-the-art audio components, such as the world-famous DC-300A high-power amp and the newer DL2 digital logic pre-amplifier. We've learned a great deal about what can and cannot be done with cir-

cuit design, with transistors and with IC's. That experience is reflected in new computer-aided circuit designs. In the *Straight Line One* phono pre-amp section, for instance, internal noise is so low that thermal noise from your cartridge will be the dominant source of noise.

This circuit technology has also made possible other features you're bound to enjoy. The phono pre-amp is a separate module, much like the system developed by Crown in the DL2. It eliminates troublesome RFI. Note also that Crown put distortion indicators on both units. The amplifier has both the unique Crown IOC circuit plus new peak output voltage LED's. Front-panel speaker switching and a new concept in DC speaker protection provides flexibility of layout and security of operation at high levels.

Visit your Crown dealer soon. Listen to the clean, full range sound of the *Straight Line One* and the *Power Line One*. That experience should simplify your buying decision. Or write us now for the full printed story.

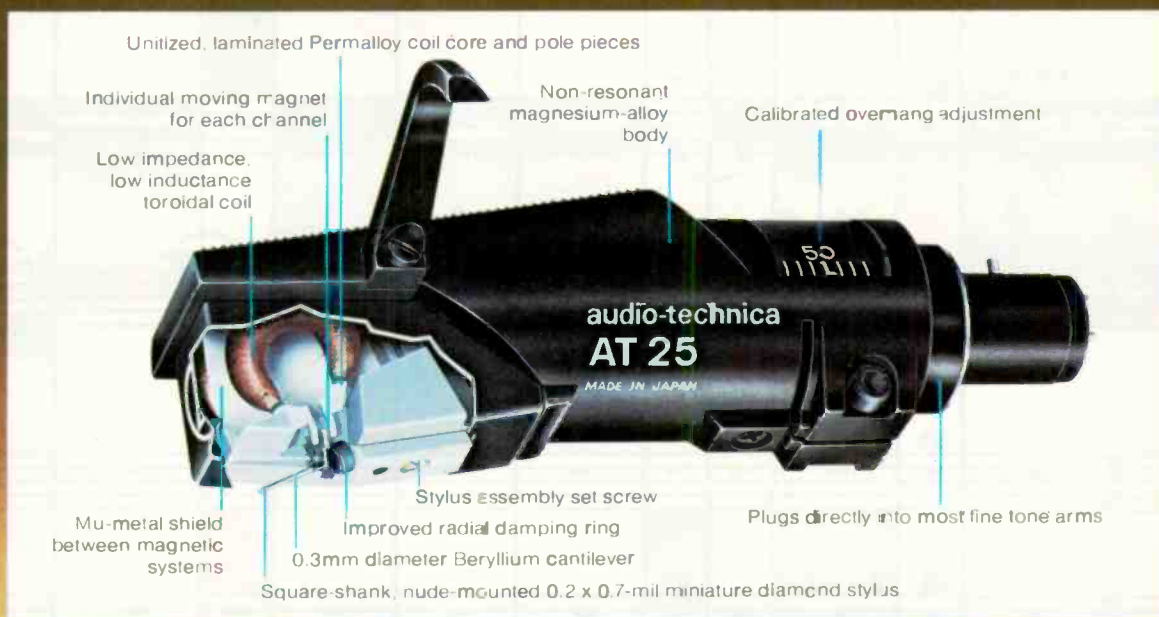


1718 W. Mishawaka Road, Elkhart, Indiana 46514

Innovation. High technology. American. That's Crown.

Circle No. 26 On Reader Service Card

# We've just improved every record you own.



## Bold, creative new technology sets new standards for clarity, dynamic range, and stereo separation.

Of course the new AT25 doesn't look like other stereo phono cartridges. It's entirely different. And not just on the outside. We've rethought every detail of design and construction. All in the interest of the smoothest, cleanest sound you've ever heard. The AT25 frequency response is utterly uniform. Definition and stereo separation are remarkable. Dynamic range is awesome. Even the most demanding digital and direct-to-disc records are more spectacular, more musically revealing.

But set our claims aside and listen. The AT25 is unequalled for transparency and clean, effortless transient response. Individual instruments are heard crisply, without stridency even at extremely high levels. Even surface noise is less apparent.

The cutaway view shows you how we do it. Start with the coils. Just two, hand-wound in a toroidal (doughnut) shape. A unique shape which cuts losses, reduces inductance, and lowers impedance. The coils are wound on laminated one-piece cores which also serve as pole pieces. Again, losses are lower. Eddy current effect is also reduced. Which all adds up to superior transient response. It's like having the electrical performance of the finest moving coil designs, but with the high output of a moving

magnet. The best of both worlds!

Each magnetic system is completely independent. No common circuits. We even add a mu-metal shield between the coils to insure no leakage between channels. Which results in stereo separation which must be heard to be believed.

But there's more. An entirely new stylus assembly with one of the smallest whole diamond styli in series production. Only 0.09mm in cross section and almost invisible. It's nude-mounted and square-shank to insure exact alignment with the groove. And it's set in a Beryllium cantilever that eliminates flexing.

Instead of snapping into place, this stylus assembly is held rigidly to a precisely machined surface with a small set screw. A small detail which insures perfect alignment, no spurious resonances, and simple stylus replacement.

We treat cartridge shell resonances too, with special damping material applied to the top of the unique plug-in shell. The magnesium shell even has a calibrated adjustment for stylus overhang to insure perfect installation.

The many technical differences between the new AT25 and every other stereo cartridge are fascinating... and significant. But the real difference is in the resulting sound. It's almost as if you had plugged your stereo system directly

into the studio console. Every subtlety of artistic expression is intact, no matter how complex—or simple—the music, no matter how loud—or soft—the performance. It's as though a subtle barrier had been removed adding clarity and presence to every record you own.

A cartridge of this sophistication and high quality cannot be produced quickly. Initially the AT25 may be in short supply. But your patience will be rewarded with performance which will send you back through your record library to discover nuances you never suspected to hear. And you'll eagerly await the sonic splendors of tomorrow's digital recording techniques.

This outstanding performance is now available two ways: the direct plug-in AT25 and the standard-mount AT24. Either one will make every other component you own sound better, including your records!



Model AT25 Unitized Headshell/Dual Magnet™ Stereo Phono Cartridge \$275

Model AT24 Dual Magnet™ Stereo Phono Cartridge \$250



**audio-technica**  
INNOVATION □ PRECISION □ INTEGRITY

AUDIO-TECHNICA U.S., INC., Dept. 99BG, 33 Shlawassee Avenue, Fairlawn, Ohio 44313

Circle No. 39 On Reader Service Card

zu 2

*ff*

*p*

zu 2

This page contains a musical score for a vocal and piano piece. It features two systems of staves. The first system has four staves: two vocal staves and two piano staves. The second system has four staves: two piano staves and two vocal staves. The music is in 2/4 time and includes dynamic markings such as *ff* (fortissimo) and *p* (piano). The score is decorated with colorful watercolor-style illustrations of landscapes, including trees, hills, and sunsets, which are placed within the musical staves.

*ff*

*ff*

*ff*

*ff*

*p*

*p*

*p*

*ff*

This page contains a musical score for a piano and vocal piece. It features two systems of staves. The first system has four staves: two piano staves and two vocal staves. The second system has four staves: two piano staves and two vocal staves. The music is in 2/4 time and includes dynamic markings such as *ff* (fortissimo) and *p* (piano). The score is decorated with colorful watercolor-style illustrations of landscapes, including trees, hills, and sunsets, which are placed within the musical staves.

# Sony Tape. Full Color Sound.

Music is full of color. Incredibly beautiful color. Color that you can hear...and (if you close your eyes) color you can almost see. From the soft pastel tones of a Mozart to the blinding brilliant flashes of hard rock to the passionately vibrant blues of the Blues.

In fact, one of the most famous tenors in the world described a passage as "brown...by brown I mean dark...rich and full."

Music does have color. Yet when most people listen to music they don't hear the full rich range of color: the instruments are playing. They either hear music in black-and-white, or in a few washed-out colors.

That's a shame. Because they're missing the delicate shading, the elusive tints and tones, the infinite hues and variations of color that make music one of the most expressive, emotional and moving arts of all.

Music has color. All kinds of color. And that is why Sony is introducing audio tape with Full Color Sound.

Sony tape with Full Color Sound can actually record more sound than you can hear.

So that every tint and tone and shade and hue of color that's in the original music will

be on the Sony tape. Every single nuance of color, not just the broad strokes.

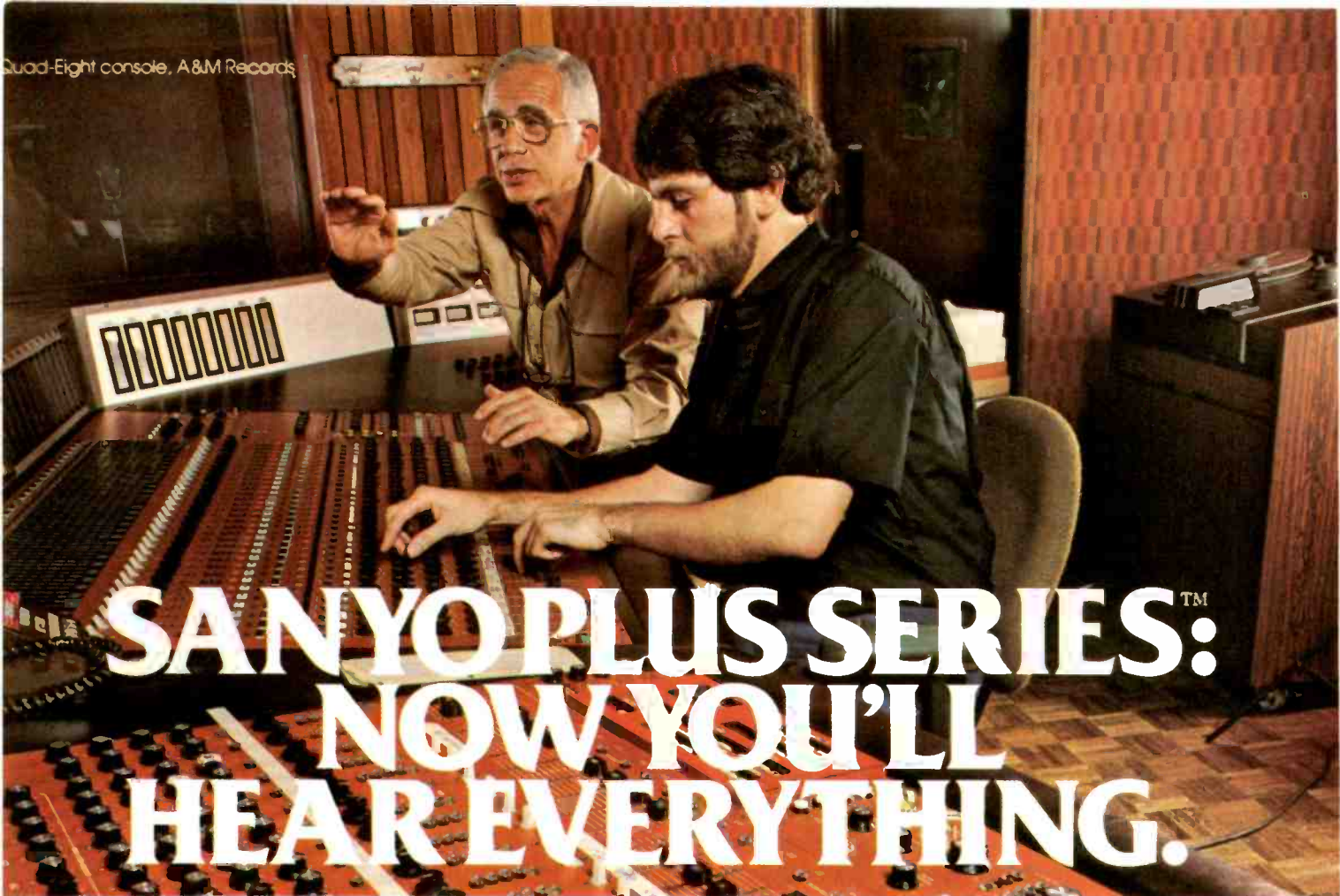
Sony tape with Full Color Sound is truly different. Full Color Sound means that Sony tape has a greatly expanded dynamic range — probably more expanded than the tape you're using. This gives an extremely high output over the entire frequency range, plus a very high recording sensitivity.

There's even more to Sony tape with Full Color Sound, however. Sony has invented a new, exclusive SP mechanism for smoother running tape, plus a specially developed tape surface treatment that gives a mirror-smooth surface to greatly reduce distortion, hiss and other noise. Each type of tape also has its own exclusive binder formulation, that gives it extra durability.

Any way you look at it — or rather, listen to it, you'll find that Sony tape with Full Color Sound is nothing short of superb.

If you're not hearing the whole rainbow on your audio tape, try recording on Sony tape with Full Color Sound. Then you'll be hearing all the glorious full color that makes every kind of music, music.





# SANYO PLUS SERIES:™ NOW YOU'LL HEAR EVERYTHING.

Today's studio technology is putting sounds on record that most home stereos simply can't cope with.

So instead of hearing everything the way it went down at the recording session, you miss the subtle nuances that make the music come to life.

The refined technology of Sanyo PLUS SERIES components lets you hear every

detail captured in your recordings — without perceptible noise, distortion, or coloration to spoil the sensation of living, breathing music.

Hear the gloriously true-to-life sound of Sanyo soon at better audio dealers.







## Sonny Rollins/by J.R. Taylor

□ In the summer of 1959, tenor saxophonist Sonny Rollins obliged his longtime associate Thelonious Monk by giving up his leader's status to work a two-week engagement as a sideman. Then, quite unexpectedly, Rollins vanished from the jazz scene for more than two years. Returning to recording and public performance in 1962, he was the object of an eccentric celebrity, as if he were not allowed the same privilege of retiring briefly for study, contemplation and relief from the pressure of frequent performances that any other artist might have taken.

Ever since, Sonny Rollins has somehow managed (no doubt against his will) to remain controversial. In the 1960s he was questioned for moving in the direction of Ornette Coleman's free jazz. In the 1970s, he has been called to account for appearing to cater to popular taste. And between 1966 and 1972, he entered another "retirement," performing little and recording nothing at all. In every possible way—and with every possible advantage for the listener—Sonny Rollins has paid the price of public scrutiny of his greatness.

Rollins's career as a working bandleader began on records with *A Night at the Village Vanguard* (Blue Note), with the groundbreaking pianoless trio of bassist Wilbur Ware and drummer Elvin Jones; their interplay forecast the later partnership of Jones with

John Coltrane. Two decades later, the two-record *More from the Vanguard* (Blue Note) filled out our picture of this "live" session, though with less interest than the single-disc original.

Immediately following the *Vanguard date*, Rollins made *Sonny Rollins* (Archive of Folk and Jazz), but only part of the record features him on tenor—Frank Foster is heard throughout the rest of the album. Among the Rollins selections, "Sonnymoon for Two" stands out.

*Way Out West* (Contemporary) is another pianoless trio, with Ray Brown's bass helping and Shelley Manne's drums present in body if not spirit. Rollins is orderly, cool and delightful here. *Sonny Rollins and the Contemporary Leaders* (Contemporary), an LP featuring a larger group including vibist Vic Feldman, has been unfairly overlooked.

More than three years later, around 1963, Rollins returned to recording with *The Bridge* (RCA Victor), featuring guitarist Jim Hall. Though it could be labeled as formally adventurous, the album was nonetheless seen at the time as

(Continued on page 82)

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.



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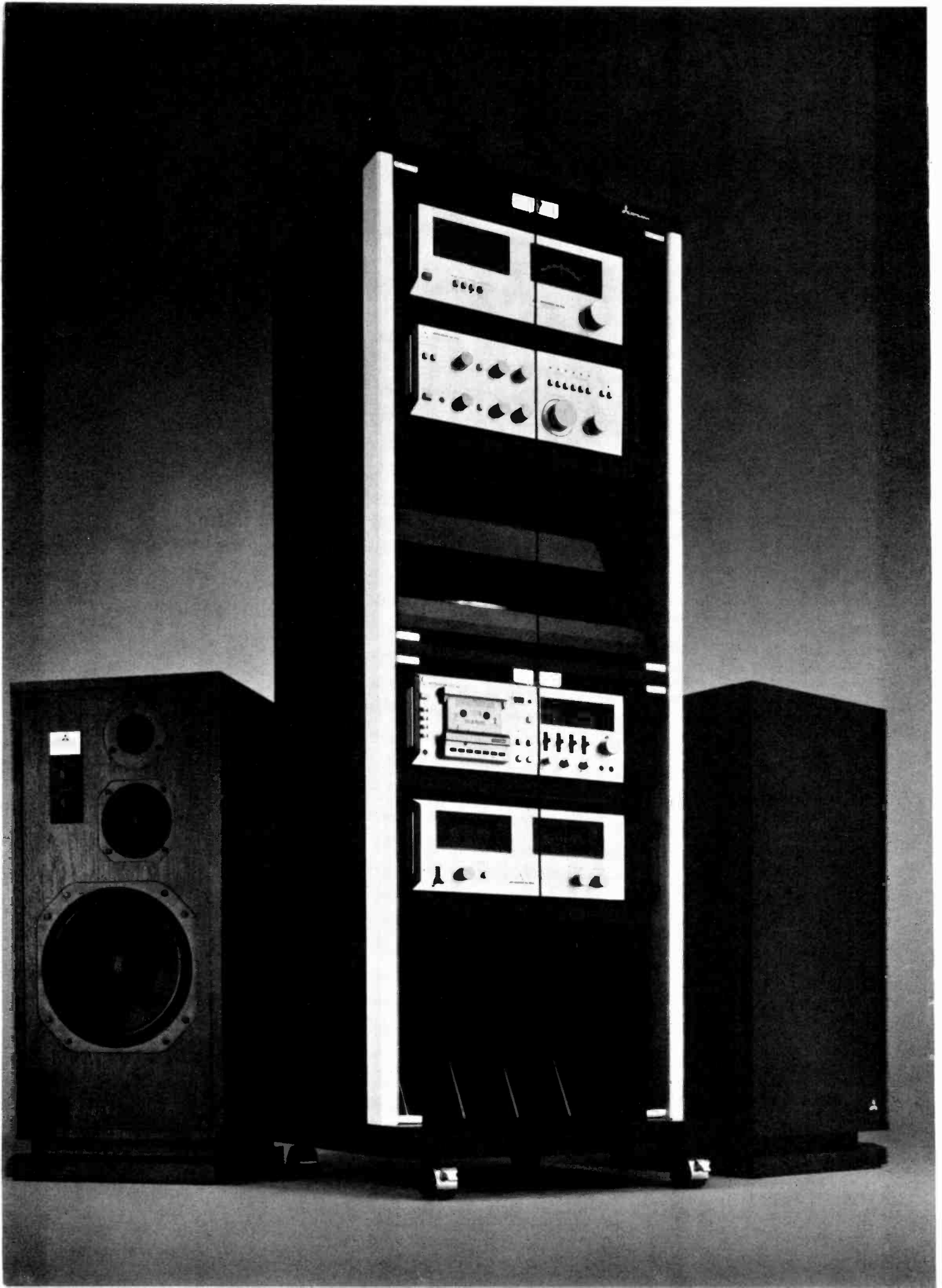
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# The Ritzy Mitsubishi.

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A 75 watt, 100 watt, or 150 watt amplifier, each capable of 80 dB inter-channel separation, a high signal-to-noise ratio and low distortion.

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A three-head, closed loop, dual-capstan drive tape deck, complete with feather touch controls that let you record professional quality cassette tapes.

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An AM/FM stereo tuner with a quartz-PLL synthesizer, plus LED's and digital read-out, for the ultimate in tuning accuracy and convenience.

Peak meters that can dock with the amplifier and monitor your equipment channel by channel. So you can maintain perfect balance and protect the system from overload.

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the spurious vibrations caused by conventional paper cone speakers, because they aren't made from paper.

Instead, we make our cone with an aluminum honeycomb core in a sandwich of glass fiber. The honeycomb structure is rigid enough to maintain its shape, yet light enough to be exceptionally responsive.

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One name. One look.

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# AUDIO SHOWCASE

(Continued from page 10)

range drivers are vertically aligned on a sloping baffle to provide offset to correct for time delay distortion over a wide horizontal listening field. The offset drivers, in conjunction with the ideal 6dB/octave crossover slopes, produce completely phase coherent (minimum phase) reproduction, so that even at the crossover frequencies, transient response is excellent, according to the company. The overlapping ranges of the individual drivers contribute to smooth response and natural reproduction. Deep bass frequencies are produced by an 8-inch passive radiator. The system, with a fourth-order Butterworth tuning, has a 3 dB down point of 37 Hz. Efficiency is 88 dB/watt-meter, and recommended power is 20 to 150 watts. The overall amplitude response is said to be a flat  $\pm 2$  dB and the phase response is minimum  $\pm 15$  degrees from 37 to 20,000 Hz. The cabinets are finished in oiled, lacquered, and hand-rubbed walnut, rosewood, teak or oak \$500.

tape head, signal seeking, feather-touch electronic tuning and a preset memory scan capable of recalling ten stations. This top-of-the-line unit is claimed to represent a "new advance in high-end



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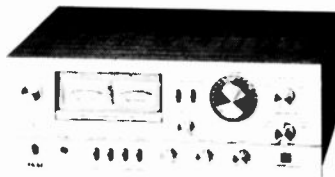
auto sound." It provides 12 watts RMS power per channel at 1 kHz with THD less than the one percent. Wow and flutter is put at 0.15 WRMS and frequency response is 50 to 12,000 Hz. The model's trimplate is breakaway (from 193 by 68 mm, to 190 to 60 mm) and the unit is provided with dummy shafts adjustable to 160 mm pitch for most flexible installation. The micro-computer center-tunes and recalls up to ten preset stations, five for AM and five for FM. There's also automatic reverse with locking fast forward and rewind, distance/local switch and stereo/mono switch. The electronic controls for tone, volume and balance "are probably the most unusual in the industry." Separate buttons for each of four speakers provide gradually increasing or decreasing side-to-side balance and front-to-rear fading as the buttons are held down. Likewise, treble and bass controls and the volume control are electronically operated to achieve sound selection at the touch of a finger. The unit can also be operated as a pre-amplifier with the addition of an external amplifier through PCA jacks and a line-out/pre-amp out switch. Suggested retail price: \$595.

## Integrated Amplifier

Akai's top-of-the-line integrated amplifier, Model AM-2850, is a DC amp that offers 85 watts per channel continuous output power, minimum RMS, at 8 ohms from 20 to 20,000 Hz with no more than 0.08% total harmonic distortion. Features include: a power meter; audio mute; triple-system speaker connections; low and high fil-

## Side/Front Loaded Speakers

Design Acoustics offer a three-way, side and front loaded loudspeaker system that is designed to provide omni-directional dispersion and flat acoustic power

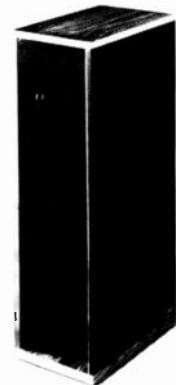


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ters; loudness switch; controls for base, midrange and treble. The unit weighs 34.5 pounds and measures 17.3 inches wide by 6.7 inches high by 16.9 inches deep. Suggested retail price is \$465.

## In-Dash Automatic Cassette

MetroSound's MS-9655 "all-in-one stereo system" is an in-dash automatic reverse stereo cassette system with digital microprocessor AM/FM/MPX radio featuring high-performance sendust



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response by means of low frequency  
(Continued on page 23)

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The Pro/4 Triple A's extra large voice coil and oversized diaphragm deliver a smooth frequency response over the entire bandwidth of sound. Highs are brilliant, crisp and clean. And the bass pulsates with a rich, deep vibrance.

The Triple A's direct-contour Pneumalite® ear-cushions provide a gentle, yet perfect seal that increases bass response to below audibility. And

everything about the Triple A, including its dual suspension headband, is human engineered for long wearing comfort.

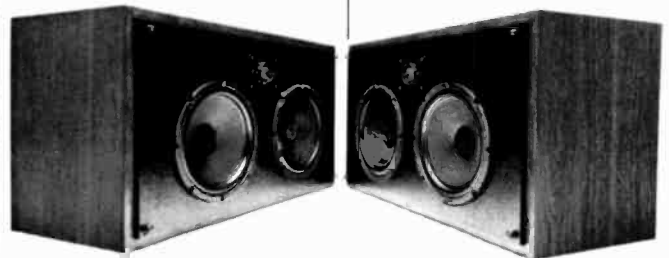


## KOSS ESP/10

The ultimate Sound of Koss is the electrostatic ESP/10. It's specifically designed for those who want the most precise reproduction of stereo-phone sound. What you hear with the ESP/10 is

near-zero distortion over all ten audible octaves. And what you experience is the most accurate excursion into sound that has ever been achieved.

The Koss ESP/10 is indeed the electrostatic



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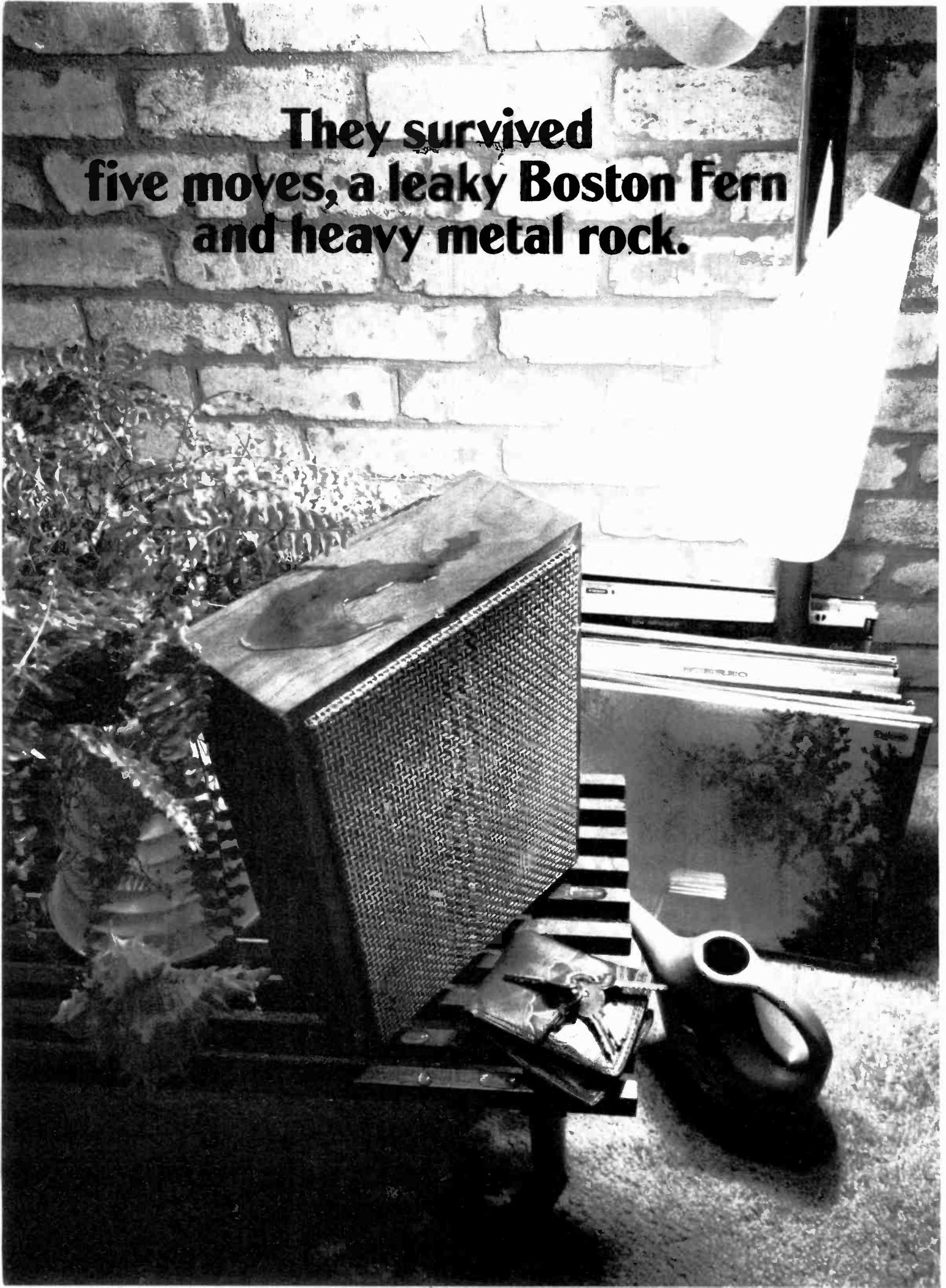
stereophone that has it all: a patented energizer that features an automatic overload protector, semi-peak reading VU meters, and an outlet for an additional set of stereophones. Each a final touch of perfection for the ultimate Sound of Koss.

## KOSS CM 530

Write us c/o Virginia Lamm, for our free full-color catalog on the Sound of Koss. And when you visit your audio dealer for a live demonstration of Koss stereophones, take an extra moment to hear the perfect pair. The computer maximized Koss CM 530 bookshelf speakers. Whether you place them horizontally or vertically on your bookshelf, the Koss CM 530's deliver perfect mirror image sound. And whether it's loudspeakers or stereophones, once you've experienced the Sound of Koss you'll be spoiled for anything else.

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five moves, a leaky Boston Fern  
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# Now you're ready for JVC's new Zero Series, with sound so good you may have to move again.

Your speakers are the most important part of your hi-fi. No matter what you drive them with, they're the only part of a system you actually hear. Yet many of us have had to compromise with bargain bookshelf speakers until our budgets could catch up with our tastes.

Now you'll be glad you waited to buy new speakers.

Now you're ready for JVC.

We started out at ground zero by considering two factors.

1) The source: Modern studio engineers cram up to 32 tracks of gutrocking bass, pounding percussion, close-miked vocals and sizzling cymbal and percussion onto a record with more technology and production breakthroughs every day.

2) The signal chain: Digital and direct disc mastering, moving coil cartridges, high-powered low THD amps and metal particle tape can seriously challenge any conventional speaker on the market today.

So we started with a PowerRibbon tweeter that can turn 200 watts of power into crisp, precise, widely dispersed highs using a driver diaphragm nearly twice as light as most conventional dome tweeters. Crank a digital record or metal tape up loud and you get beautiful highs, not a puff of smoke.

We studied midrange cone flex and then computer designed a phenolic cone, aluminum dome mid that achieves multi-octave



The lighter it is, the faster it moves. A conventional dome tweeter outweighs the JVC PowerRibbon polyimide ribbon element by almost 2:1

piston motion with wide dispersion and low distortion for realistic instrumentals and intimate vocals.

And finally we determined why a woofer's cone can turn out flabby bass. It's a cone.

All the exotic materials, coatings and magnet structures in the world just yield a more expensive woofer, not a better cone shape. Our computer-designed Alpha woofer is a concave curve for maximum rigidity, driven by a long-throw heat-resistant voice coil and massive ceramic magnet structure.

The result is tight low bass with depth, not boom.

When you mount these special drivers in a rosewood veneer enclosure and fine-tune them with our unique Phase-Moire Propagation technique, you have a design whose excellence needn't rest on a single "latest breakthrough." Rather, here is a total speaker design, for the world of sound yet to come.

So before you subject yourself to the cross talk of hundreds of speaker brands, call

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One test-listen and you'll be ready for JVC.

Shown: Zero-5 3-way 200W peak input, 30-50,000Hz, 92dB/W (1M); Zero-9, 3-way with additional differential resonance active 12" woofer, 300W peak input, 20-50,000Hz, 92dB/W (1M). Not shown: Zero-3, 3 way with same woofer/tweeter, 3" metal dome/phenolic cone mid, 150W peak input, 35-50,000Hz.



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TEAC

# WE'VE GOT THE GUTS.

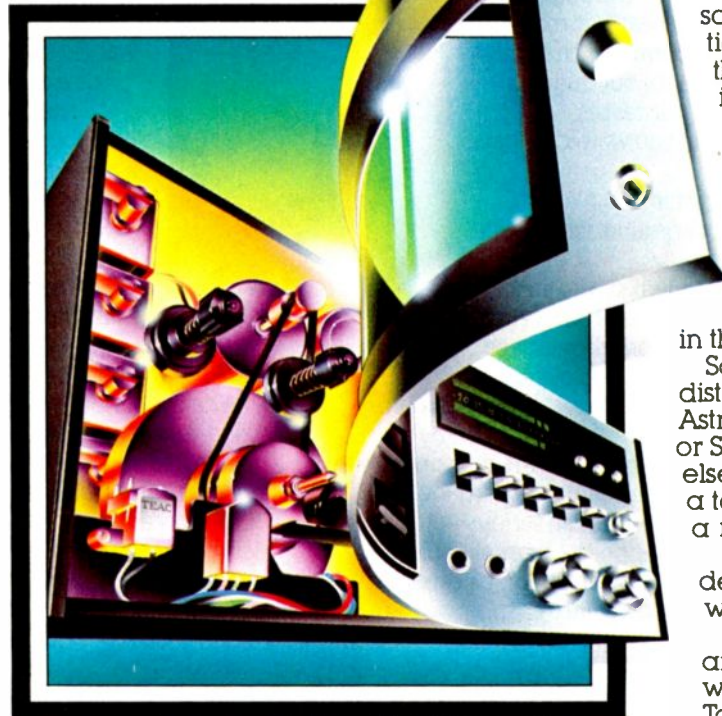
Look inside any tape recorder and you'll find the parts that really matter. The parts that define the ultimate quality of your sound. The transport mechanism.

Transports must work in a world of micro-tolerances. A millionth of an inch error can ruin your audio quality. Because when the transport errs, no amount of electronic wizardry can replace the lost fidelity.

Consider the TEAC transport. Capstans formed on computer-controlled lathes and perfected on industrial micro-grinders. Massive flywheels, inertially balanced. Solenoids typically twice the size and power of those used in other decks. Belts that are tested for dimensional stability under the most severe temperature, humidity and atmospheric conditions.

The results of this specialized design and manufacturing technology are unusually high levels of accuracy, stability and durability. Proven qualities that make a TEAC sound better initially and maintain its sonic integrity after years of use.

Often, to reach these performance criteria, we've found current state-of-the-art con-



cepts lacking. So through the years, we've introduced new technologies.

Like the first cassette deck with integral Dolby\* noise reduction in 1971. And the first cassette transport to break the 0.1% wow & flutter barrier in 1973. Designs that helped make the cassette deck a respectable high fidelity component.

Today, we're producing cassette components with instrumentation drive systems. Mechanisms taken right out of our own data recorders. These transports are

built to withstand continuous read/write use in computer installations. Where megadollars are at stake. And reliability is everything.

Soon you'll see the first popularly priced cassette decks with integral dbx\*\* noise elimination. Originally designed for open reel recorders in professional recording studios, the dbx system gives you sound so quiet, so noise-free, it's scary.

Twenty-five years of specialization has taught us that design balance is critical for quality

sound reproduction. So you'll find that balance in every TEAC.

The proof is in the results. That's why more professional recordists rely on TEAC machines than any other make in the world.

So next time you're distracted by an Astro-this, Fluoro-that or Spectro-something else, remember: a tape recorder is a machine.

How well it works depends on how well it's made.

Look into a TEAC, and you'll find that we've got the guts.

To show you what's inside. To let you evaluate our performance. To make you the final judge.

To us, it's a matter of craftsmanship. To you, a matter of decision. Because when you peel away the bells and whistles, you find the real measure of every tape recorder. Especially ours.

For more information, see your TEAC Audio dealer.

Or write us at Dept. SG-9.

\*Dolby is a registered trademark of Dolby Laboratories  
\*\*dbx is a registered trademark of dbx inc

## TEAC®



# AUDIO SHOWCASE

(Continued from page 18)

and high frequency drivers mounted on slanted side panels, and by the use of cone and dome drivers to take advantage of their complementary characteristics. Model D-4A has drivers on three panels: woofers and tweeters on the angled side panels, and a midrange driver and dome tweeter on the front panel. Mounting the woofers on the side panels gets them closer to the walls to reduce "interference effects." Specs: frequency response, 25 to 18,000 Hz  $\pm$  3 dB; dispersion angle, 180 degrees horizontal and 90 degrees vertical; woofer free air resonance, 24 Hz; system resonance frequency, 41 Hz; recommended amplifier power, 20 to 125 watts per channel; crossover frequencies, 700 and 2000 Hz; maximum sensitivity, 92 dB; nominal impedance, 4 ohms; controls, low frequency and high frequency level attenuation (3 db). Price: \$297.

## Front-Loading Cassette Deck

A Micro-computer Music Selector that locates songs you want to hear, quickly and easily, is just one of the convenience features offered with this Technics Model RS-M56 front-loading stereo cassette deck. Other features include a two-color FL Bar Graph, Peak Meter for precise indication of input signal level. A fine bias adjustment permits tailoring to specifications of any conventional tape formulation. Other details worth noting: FG servo motor and vertical-hold mechanism; Dolby NR; Technics HPF record/playback head. The Micro-computer Music Selector utilizes a built-in microcomputer that searches the cassette tape for any specific song among twenty possible selections. When it finds the right song, the tape transport system automatically switches from the cue (or review) mode to play mode. The microcomputer accomplishes this by detecting the blank spaces that separate the songs from each other, and then by "counting" forward or backward as the tape



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is travelling. Each song is assigned its own "music address" which is simply the order in which it appears on the tape. Other features: memory auto-play; oil-damped soft loading and unloading; mic/line mixing; a timer standby mechanism; full auto stop mechanism, L/R friction-coupled input-level controls, output level control, stereo headphone jack. The tariff? \$500.

## Dynamic Stereophone

This Koss Tech/2 Stereophone is a medium-priced model selling for \$59.95. The dynamic system has a range of 10 to 22,000 Hz and offers such features



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as: Koss' exclusive Pneumalite ear-cushions that seal out distracting room noises; an extra-wide, glove-soft vinyl headband cover for maximum comfort; and fully adjustable, stainless steel yokes and slide-bars to ensure a perfect fit. Slim-silhouette, embossed diamond cut elm burl earcup inlays and distinctive styling give the Tech/2 an elegant appearance. The earcushions, earcups and headband cover are ebony teak in color. Koss says the stereophone reproduces rock, jazz and classical music smoothly and accurately through the entire range of musical material.

## Hi-Fi for Boaters

Rotel's RV-555 stereo system is specifically designed for nautical use (or use in any compact location for that



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matter) to provide quality music while taking up a minimum amount of limited boat space. The "snug" 20-watt AM/FM stereo receiver is accompanied by

(Continued on page 26)

# McIntosh

## "A Technological Masterpiece ..."



McIntosh C 32

## "More Than a Preamplifier"

McIntosh has received peerless acclaim from prominent product testing laboratories and outstanding international recognition! You can learn why the "more than a preamplifier" C 32 has been selected for these unique honors.

Send us your name and address and we'll send you the complete product reviews and data on all McIntosh products, copies of the international awards, and a North American FM directory. You will understand why McIntosh product research and development always has the appearance and technological look to the future.

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If you are in a hurry for your catalog please send the coupon to McIntosh. For non-rush service send the Reader Service Card to the magazine.

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# Kevin Cronin listened to us.

He writes, sings and produces with REO Speedwagon.

He listened to the group's latest recording on our new System B.

The System B is a vented 4 way, 5 driver loudspeaker system.

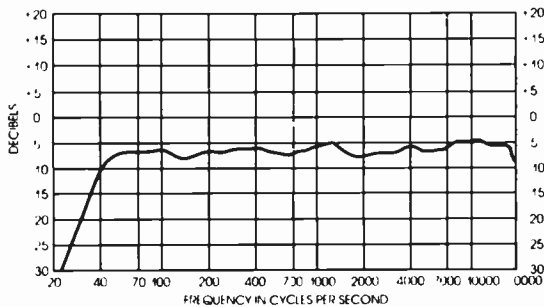
Here's what he said.

"I know exactly what's on the record so if there's anything missing, if there's anything these speakers weren't producing, I'd be the first one to fall off my chair. But I hear everything."

That's because we've gone to great lengths to minimize distortion. The System B reproduces the highest and the lowest frequencies of music with amazing accuracy and clarity.

To minimize distortion, we have painstakingly designed each individual mid and high frequency driver so that greater clarity is possible.

What's more, we've carefully selected each crossover frequency to subjugate driver resonance below critical crossover points. That completely eliminates distortion in the crossover regions.



The graph shows the acoustic power output of the System B. As you can see, the System B has an incredibly uniform acoustic power output. The result is music that is clearly defined and accurate.

And it doesn't take a high powered

amplifier to bring a loud-as-life performance of your favorite artists, either.

That's because System B blends extremely efficient drivers with a vented enclosure. This makes it possible to produce relatively high levels of music with minimal power input.

At the same time, System B has the power handling capability to produce an incredible 115 dB of sound pressure at its 150 watt rating.

We can't go into all the details of this amazing sound system in this ad.

That's why you should go to your audio dealer for a demonstration.

Your ears are the ultimate test.

But here's one more observation by Kevin Cronin, a professional musician and producer.

"I spent six months making this record, so as far as it being on the vinyl it is there and I hear everything through the speakers."

Listen to our speakers in person.

Kevin Cronin did.

## Listen with the professionals.



## Listen to JENSEN speakers.

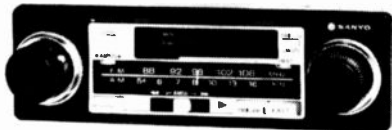
# AUDIO SHOWCASE

(Continued from page 23)

a pair of mini two-way speakers that occupy less than 1.2 cubic feet of space, plus an optional DC pulse converter for use with a standard 12 to 14 volt power supply. Frequency response is from 20 to 20,000 Hz with no more than 0.5% total harmonic distortion, and FM stereo THD is only 0.15%—“equal to the highest performing gear on the market.” Advanced design circuitry includes a Darlington direct-coupled OCL complementary power amplifier, IC ceramic filters in the FM IF sections, and a signal-strength tuning meter. The receiver also includes a tape monitor and tape in/out provisions. The two-way speaker systems are of high-efficiency air-suspension design that features a mini mid-range woofer and a 1½-inch soft-dome tweeter. The receiver weighs only 15 pounds, each speaker 7.5 pounds. The system can also be used at home, powered with regular 117-volt AC power. Prices: the music system, \$310; converter, \$100.

## Car Stereo With Auto Reverse

A totally new car stereo system with AM/FM radio and full automatic reverse cassette, featuring a new Automatic Music Select System (AMSS) is offered by Sanyo. This “affordable” (\$159.95) FT482 is highlighted by the AMSS system which seeks out and lo-



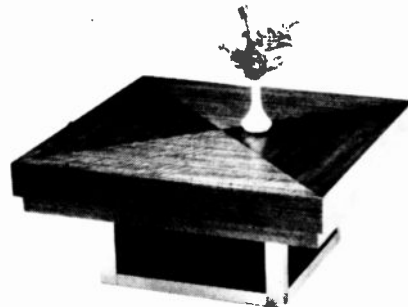
Circle No. 109 On Reader Service Card

cates any desired tape selection, by fast winding forward or back, just by the press of a lever. The full automatic reverse mechanism changes tape direction at the end of the tape, in any mode, and reverts to play mode. A fader control balances front and rear speakers, and a loudness control boosts bass and treble response at low levels for fuller sound. Additional top features include locking fast forward and rewind, combined DX/Lo and FM muting switch to help lock in weak FM signals. There are also separate volume, balance, bass and treble controls. Specifications: maximum power capability per channel, 7.5 watts RMS; frequency response, 50 to

12,000 Hz; wow and flutter, 0.08%; signal-to-noise ratio, 55 dB.

## Universal Subwoofers

Altec-Lansing offers two sub-woofers that can be linked to any existing stereo system to extend the low frequency response. The subwoofers are unaffected by various room acoustics because they incorporate their own acoustically-controlled floor. The frequency range of model LF-1 is 20 to 80 Hz  $\pm$  5 dB while that of model LF-2 is 20 to 80 Hz  $\pm$  3 dB. The principal difference between the two models lies in the power of each. The LF-2 includes its



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own outboard amplifier; hence greater dynamic range is possible because the LF-2 in effect biamps the system. Also built into the LF-2 is an electronic crossover network with crossover points selectable at 80, 60 and 40 Hz. The power amplifier is equalized to match the response of the precisely tuned speaker and enclosure. The LF-1 performs well with speaker systems of even moderately high efficiency, and uses power from the existing stereo system which limits the available dynamic range somewhat, as compared to the LF-2. The LF-1 uses a passive crossover network with a fixed crossover point at 80 Hz. A specially designed dual voice coil 12-inch bass driver is housed in the LF-1 enclosure which provides a purely acoustic combined-channel mix of low frequency program material from both left and right channels. The LF-1 and LF-2 subwoofers cost \$500 and \$800 respectively. ▲

## Audiotex auto speakers with Liqui-Glide™ for Sound-Good-Longer Sound

Audiotex auto speakers will turn you on the first time you hear them. They'll still be turning you on months later, because they'll still be delivering rich, powerful, undistorted sound.

What's the secret to their continuing good performance? All Audiotex auto speakers feature Liqui-Glide, the rare and costly magnetic fluid that improves performance by dissipating heat from the voice coil, thus increasing power handling capability. Which means you can really crank them up and they won't break down.

But Liqui-Glide also reduces distortion and aging, which means you may very well get more miles out of Audiotex speakers than you do out of your car.



Audiotex — for Sound-Good-Longer Sound

**Audiotex**  
PRODUCTS OF GC ELECTRONICS - ROCKFORD, IL 61101

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4 x 10 3-way  
Power Handling  
25 watts

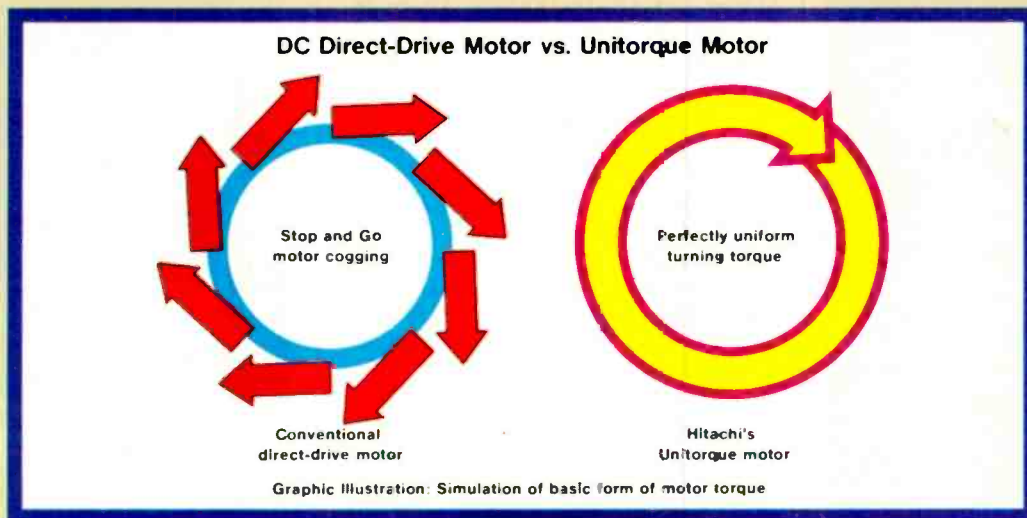
6 x 9 3-way  
Power Handling  
30 watts

6x9 Coaxial  
Power Handling  
35 watts



HI-FI/STEREO BUYERS' GUIDE

# Absolutely even torque through a full 360°



## Unitorque direct-drive turntable

Hitachi's HT-356 Semi-Automatic Turntable is the epitome of accuracy. Its patented Unitorque motor has two star-shaped stator coils arranged for precise balance, even torque distribution and low temperature rise. Brushless, coreless and slotless, it eliminates cogging and vibration. And this direct-drive marvel features quartz-locked control to keep platter speed free from deviation or drift, regardless of changes in load, temperature or line voltage.

Quartz is the most accurate frequency generating element known to man. Coupled with Unitorque's inherent smoothness, it leads to extremely low wow and flutter and virtually unmeasurable turntable rumble. 0.03% WRMS and a S/N ratio of 75 dB (DIN B).

This impressive performer also has front-mounted controls for full operation with the dust cover down. The Hitachi HT-356. It's the accurate choice.



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# popdiscs

## A review of the latest popular music releases

by KEN IRSAY



**Emmylou Harris:** "Blue Kentucky Girl." Warner Bros. \$7.98.

From the wistfulness of "Hickory Wind" and "Beneath Still Waters" to the knee-slapping whoop-dee-do of Willie Nelson's "Sister's Coming Home," Harris' crystalline voice soars above the Hot Band's excellent instrumental accompaniment. Although she's done pop and rock, Emmylou is first and foremost a country singer, and this album is grits and sausage all the way.

**McFadden & Whitehead:** "McFadden & Whitehead." Phila. International. \$7.98.

This duo has written some of the biggest R&B hits of the 70s, including



tunes for Teddy Pendergrass, Melba Moore and Gladys Knight. Their debut performing effort has Gene McFadden and John Whitehead combining slow, soulful blues with disco and outright boogie in eight self-penned compositions that make for easy listening.

**Tarney/Spencer Band:** "Run For Your Life." A&M. \$7.98.

The second rock outing from this dynamic duo features catchier melodies than their fine debut, "Three's A Crowd," but the pulsating beat is not sacrificed. Al Tarney and Trevor Spencer play all instruments, including guitar, bass, keyboards and drums. The sound is smooth, in spite of all the necessary overdubbing.



**Flash & The Pan:** "Flash & The Pan." Epic. \$7.98.

Recording as the Easybeats, George Young and Harry Vanda had a smash hit in the late 60s called "Friday On My Mind." This album, an FM programmer's delight, will either reach the Top 10 or die an undeserving death. It's rock at its hypnotic and mysterious best. Marked by fascinating arrangements, clever, insightful lyrics and semi-spoken vocals, the album combines the best elements of English rock, American pop and universal blues.

**Ian Hunter:** "You're Never Alone With A Schizophrenic." Chrysalis. \$7.98.



Solid rock drumming permeates this third solo by the former multi-instrumentalist/vocalist from the late Mott the Hoople. Hunter tackles guitars, piano, percussion and a variety of synthesizers, backed by a tight, well-mixed band.

**Leah Kunkel:** "Leah Kunkel." Columbia. \$7.98.

If genetics and environment make up the whole person, then Leah Kunkel just can't go wrong. She's the sister of the late Cass Elliott whose strong, sultry voice led the Mamas & Papas to 1960s stardom. She is also the wife of Russ Kunkel, noted West Coast drummer. In her debut outing, Leah wraps her warm, clear voice around some compositions written by the Bee Gees, Stephen Bishop and Peter McCann, among others. Members of the Section provide instrumental backup.



Exclusive 5-Way Blowout Protection: the most complete protection system with fail safe signal.

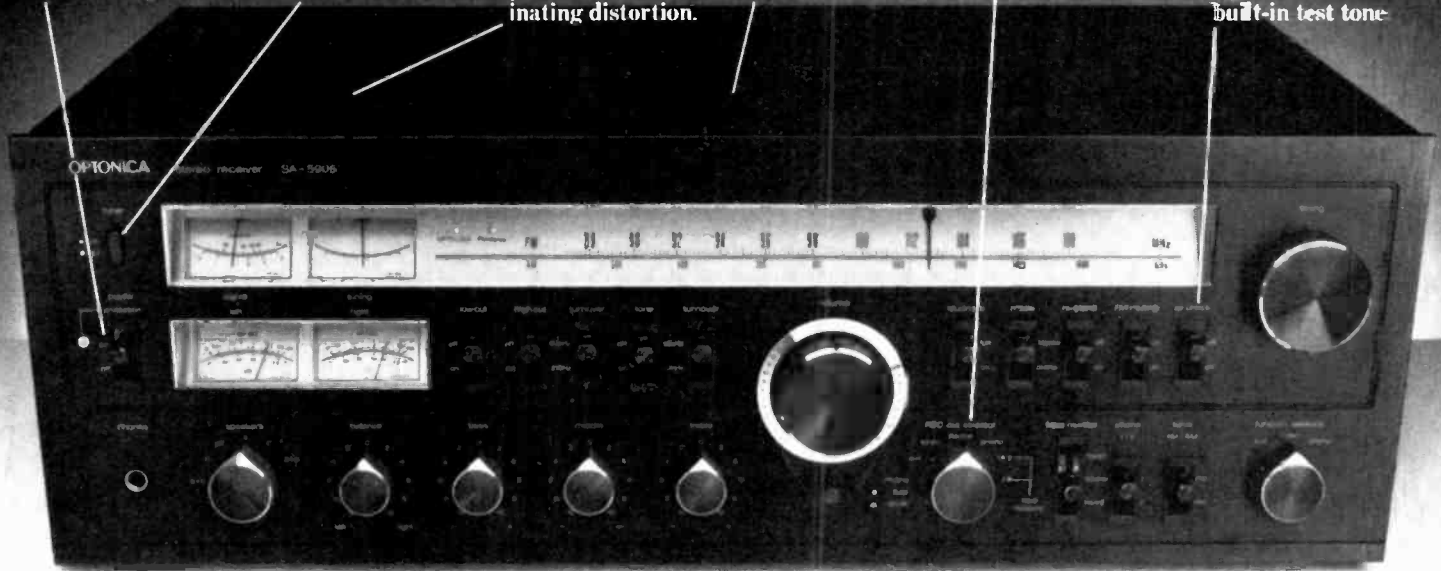
Separate On/Off Tuner Switch: allows receiver to be used like separate amp and tuner.

Exclusive 3-Stage Delta Power: three independent power supplies prevent excessive power drain, eliminating distortion.

125 Watts Per Channel RMS. Rated at 8 Ohms, 0.02% THD: super high power, super low distortion.

Double Player: listen to one source while recording from another.

Exclusive Double FM Air Check: set optimum recording levels to audible and visual signals with our built-in test tone.



## The Rare Receiver. It destroys the separate amp and tuner mystique.

Optonica's new Rare Receiver (SA-5905) combines all the technology that makes separates superior. With the convenience, specs and exclusive features you won't find on any other receiver.

The Rare Receiver gives you all the power you could ever want, an amazing 125 watts per channel RMS at 8 ohms from 20Hz-20kHz. With amazingly low distortion: 0.02% THD. And 75dB S/N ratio (stereo).

And to insure that none of that power gets lost, there's Optonica's exclusive three stage Delta Power. Giving you separate power supplies to prevent excessive power drain and further reduce distortion.

The Rare Receiver gives you unlimited versatility too. You can use it like a separate amp and tuner, just by flicking a switch.

Our exclusive 5-way blowout protection is the most complete fail-safe system we know of. Because your precious equipment needs all the protection it can get.

The Rare Receiver also gives you all the "standard" features you'd expect on ordinary receivers. And some you wouldn't. Like a 41-position detented volume control and midrange tone control.

But to appreciate what makes our Rare Receiver so rare (including our other exclusive features), you've got to see and hear it for yourself.

To enjoy that rare experience, call our toll free number: 800-447-4700 (in Illinois 1-800-332-4400). Or write us at 10 Keystone Place, Paramus, N.J. 07652, for the Optonica dealer nearest you.

Why settle for mystique, when you can own something rare?

**OPTONICA<sup>®</sup>**  
Rare Stereo.

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# pop discs

**Highway:** "Highway 1." RSO. \$7.98.

This Australian quintet used to be called Sherbet, and as such sounded very cool, refreshing and Beatlesque. They are one of the best-selling groups down under (that means Australia). Up-tempo pop/rock with smooth harmonies and tight instrumentation featuring keyboards, guitar, bass and drums mark the group's new identity. Additional horns and synthesizers provide contemporary flair.



**Roxy Music:** "Manifesto." Atco. \$7.98.

It's been over three years since the last studio album by Bryan Ferry and his band of strange but merry men. Experimentation has always been their guiding force therefore it's difficult to describe with any precision the nature of the music contained herein. The melodies, rhythms and instrumental effects are continually shifting in mood and emphasis. While the opening track, "Manifesto," is dense and brooding, "Dance Away" is lighthearted and... well... danceable.

**The Whispers:** "Whisper In Your Ear." Solar. \$7.98.

A pleasing potpourri of traditional soul ballads (some stirring, spine-tingling Moonglows memories), R&B and modern disco tunes are the latest offering from this veteran group. Excellent horn and string arrangements complement the vocals. Production is rich, with especially well-recorded rhythm tracks.

**Village People:** "Go West." Casablanca. \$8.98.

They sing with such vigorous, patriotic fervor that the Village People contain that certain musical quality needed

to turn a disco song into a marching song, even a strong military "John Phillip Sousa" marching song! "In The Navy" and the title cut of the album in particular, have that Fourth of July parade martial feel. At this writing, the group has four albums on the charts. They must be doing something right.

**Cher:** "Take Me Home." Casablanca. \$7.98.

Cher singing disco? So-so. Cher singing well-orchestrated dramatic love songs with soaring vocal lines? Sensational! "It's Too Late To Love Me Now" is the latter and it's a beauty. The album showcases both Chers.

**Orleans:** "Forever." Infinity. \$7.98.

In its first album since the departure of leader and lead guitarist, John Hall, Orleans hasn't missed a beat and the title could be prophetic. The disc is a superb blend of polished mid-tempo rock and ballads. The vocals are handled by guitarist Larry Hoppen and keyboardist Bob Leinbach with background harmonies filled in by the remaining three members. Commercial hooks abound, both lyrically and instrumentally.

**Jerry Lee Lewis:** "Jerry Lee Lewis." Elektra. \$7.98.

Not since the late 50s of the Sun Record days and his "pumping" piano has J.L.L., the "Killer," performed as he does on this disc. Producer Bones Howe says, "We recorded the same way all the rock hits were recorded in the fifties. The band was there, the singers were there and everything happened in the studio at once." Country Jerry Lee returns to his rock and roll roots. Great Balls of Fire!!!



**Raydio:** "Rock On." Arista. \$8.98. **Ohio Players:** "Everybody Up." Arista. \$7.98.

The main ingredient here is the kind of well-executed funk that makes rock music the fun it's supposed to be. Guitars, keyboards and mellow harmonies complement the beat on Raydio's second album. The group hit big with "Jack & Jill" last year. The veteran Ohio Players went disco crazy before the word was known. The sound of this sextet is primarily your basic frenzied funk with no strings to soften the blow. If you're in a boogie mood, you'll need no more than these two.



**Osmonds:** "Steppin' Out." Mercury. \$7.98.

Awright!, who slipped the "funky pills" into the Osmonds' cocoa? These are the older Osmond boys, not Donnie and Marie, and they've just passed through the Twilight Zone into the world of contemporary-disco-melodic-harmonic pop. And a fine entry it is, with Maurice Gibb co-producing.

**Silvetti:** "Concert From The Stars." Sire. \$7.98.

Even if you're "mad as hell and won't take disco anymore," you've got to credit the genre with inspiring excellence among recording engineers and producers. This disc, with the standard Latin rhythms enhanced by string and background vocal accompaniment, is a prime example of painstaking recording. Crisp, good mixing and stereo imaging are heard here.

**Nina Simone:** "The Family/Baltimore." CTL. \$3.98.

This is a super-hot remix of two tunes from Nina Simone's "Baltimore" album, marking the debut of CTL's "12-Inch Ruler" series of 45 RPM singles. A debt of gratitude is owed the label for mixing Nina's one-of-a-kind voice well up front. For super fidelity, you can't beat Nina Simone at 45 RPM. ▲



# LITERATURE LIBRARY

**307.** Nautilus Recordings supplies a booklet called **The Superdiscs—There is a Difference.** It explains in detail the differences between analog-to-disc recording (used to make most records), direct-to-disc recordings, and digital-to-disc recordings. The sonic advantages of direct-to-disc and digital-to-disc recordings are explained—questions about their limitations and relatively high cost are answered.



**317.** Empire Scientific, the company that manufactures a complete line of phono cartridges, explains the important role the cartridge plays in producing quality music in their brochure entitled, **How To Get The Most Out Of Your Records.** The entire recording process is given, detailing the different magnetic pickup systems used for hi-fi systems. Guidelines for choosing the right pickup—evaluating tracking ability, tracking force and stylus shapes—provide worthwhile information. An entire line of cartridges in a wide price range are illustrated.

**318.** Audio-Technica breaks down the technical language of microphone mechanics in its pocket-sized pamphlet entitled **A Brief Guide to Microphones.** Various types as well as the advantages of key features are spelled out, along with explanations of eight basic terms needed for understanding a microphone's operation. Models most suited for high quality recording and broadcasting and sound reinforcement are emphasized.



**319.** Acoustic Research tells how to make a more informed judgement when buying speakers in

their **Truth In Listening** brochure. Practical considerations such as price, design and engineering are noted, as well as technical information such as sound waves and their relationship to speaker placement. All this is provided to make selecting speakers trouble free.

**320.** Audio Control's booklet, **How To Hook Up And Enjoy Your Stereo System,** compiles sound advice on how and where to set up your hi-fi. A separate section on equalization—what it is and why it makes music sound better—is given for the stereo enthusiast.

**321.** Fujitsu Ten Corporation of America offers brochures which show how to match their **specially designed car radio and tape player units** with your car. Their application chart makes it easy to select the in-dash sound system unit best suited for your particular make and model of car by listing the various systems (car radio, stereo, cassette, 8-track) along with all domestic and foreign cars. Trucks, vans and jeeps are also provided for.



**322.** Studer Revox, manufacturer of all types of audio equipment, tells all about their design philosophy in a photo-filled, easy-to-read brochure. Featured are **magnetic tape recorders** and **audio mixing consoles** as well as accessories needed to complete any sound system.

**323.** TEAC has put out a **White Paper On Tape Technology** that explains such technically confusing subjects as recorder metering systems, transport mechanics, and the derivation of their specifications. A statement of their corporate philosophy on design is given for comparison with other manufacturers.

**HI-FI STEREO BUYERS' GUIDE, Dept. LL-20 BE SURE TO ENCLOSE MONEY**  
 Box 1849, G.P.O., New York, NY 10001 September/October 1979

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307                      318                      319                      320                      321                      322                      323

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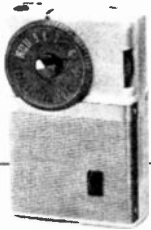
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This offer expires March 2, 1980 Allow 4 to 6 weeks for delivery

# There is only one real pioneer It's Sony.



**1957:**  
The world's first pocket transistor radio.

In 1954, a fledgling Japanese tape recorder manufacturer visited America to investigate a new device called the transistor.

At first, things were less than encouraging. "Transistors are only good for hearing aids," they were told. "And besides, they can't be mass produced."

Undeterred, the Japanese representatives returned to Tokyo.

Thirty-six months later, the world saw its first pocket transistor radio.

Followed by the world's first all-transistor FM radio.

**1954:**  
The first Japanese transistor.

And, partially as a sign of their continuing dedication to audio, the Tokyo Telecommunications Engineering Corporation adapted the Latin word for sound—"sonus"—and changed its name to Sony.

In the years that have followed, Sony has never faltered in its dedication to technological innovation. And we'd be loathe to estimate how often our advances have ended up on the circuit boards and front panels of our competitors' equipment as "technological breakthroughs."

But enough of the past. The hi-fi components featured here stand as eloquent proof that Sony—the

company that virtually founded the era of transistorized high fidelity—is still at its very forefront.

## The V5 receiver:

To this day, only Sony offers Sony quality.

Unlike hi-fi receivers designed to impress you with a facade of magic buttons and switches, Sony receivers are designed to impress you with rich sound.

Case in point: the V5.

In technical terms, the V5 delivers 85 watts per channel at 8 ohms from 20 to 20,000 hertz with no more than 0.07% total harmonic distortion.

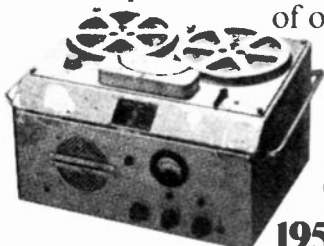
In human terms, this means the receiver can reproduce every note of music any instrument can play with no audible distortion. And it can power two sets of speakers without straining.

But that's only the beginning.

Instead of using the mundane power transformers found in competitors' products, the V5 utilizes more expensive toroidal core transformers that provide richer bass.

## A few Sony Audio firsts:

- 1949:** Obtained patent on the basic magnetic tape-recording system.
- 1952:** Developed stereo broadcasting in Japan.
- 1954:** Introduced condenser microphone.
- 1955:** First consumer stereo tape recorder in Japan.
- 1959:** Invented "Tunnel Diode": basis of all high-speed, low-distortion semiconductors.
- 1965:** First all-silicon solid state amplifier.
- 1966:** The first servo-controlled turntable. Forerunner of quartz-locked turntables.
- 1968:** First electronic end of record sensor.
- 1969:** First digital-synthesized FM tuner.
- 1969:** Invented the ferrite tape head.
- 1973:** Invented the V-FET: Opened era of high-speed transistors.
- 1973:** First to manufacture ferrichrome tape.
- 1973:** Dr. Esaki wins Nobel Prize in Physics for "Tunnel Diode."
- 1975:** First turntable with carbon-fiber tone arm.
- 1977:** The world's first consumer digital audio processor.
- 1977:** First consumer amplifier with pulse power supply.
- 1978:** Patented liquid crystal recording meters.



**1950:** Japan's first tape recorder, the "Type G."



**1979:** The V5 receiver: Designed for people who appreciate value as much as they appreciate sound.

# in high fidelity.



**1979:** The new TA-F40 integrated amplifier and ST-J60 digital synthesized FM tuner. Separate components that sound as sophisticated as they look.

Instead of cutting corners by using a flimsy pressboard bottom, we've cut interference by encasing the *entire* receiver in metal.

And for better FM reception, instead of using the standard three- or four-gang variable-tuning capacitor, we've opted for a higher quality five-gang model.

All of which explains why if you pay a few dollars less for one of our competitors' receivers, it's probably because you're getting less receiver.

**The new Sony cassette decks:  
The state of the art, from the  
people who invented it.**

Since we introduced tape recording to Japan in 1950, Sony has sold millions of tape decks.

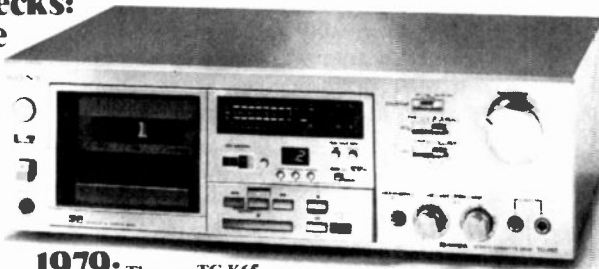
A quick look at our new TC-K65 cassette deck will explain why.

Like all two-motor cassette decks, the TC-K65 is designed for low wow and flutter. Unlike others, however, we feature "brushless and slotless" motors that reduce this problem to the point of being inaudible.

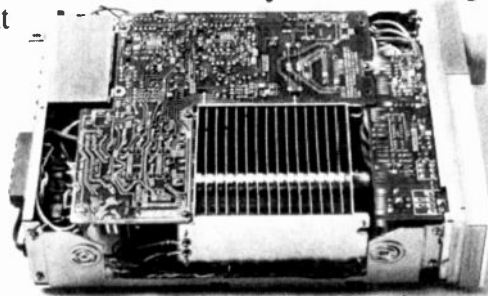
Instead of using just any tape head material, the TC-K65 features Sony "Sendust and Ferrite" heads that combine wide response with extreme durability.

Instead of using an ordinary metering system, we've developed a 16-segment LED meter whose life expectancy far exceeds the fancy blue fluorescent models other companies are currently touting.

And there's also a "Random Music Sensor" for preprogramming tapes, settings for metal



**1979:** The new TC-K65. Sony remains one of the only hi-fi companies to produce our own tape transports, motors, meters, heads—even the tape itself.



**1979:** The Sony "ThermoDynamic Cooling System." Until now, only available in satellites.

tape, remote control and timer capabilities, and the kind of high-quality D.C. tape head amplifier you'll find in almost no one else's tape decks.

**But you really haven't heard anything yet.**

Unfortunately, we don't have enough space here to tell you the complete Sony hi-fi story.

Like the way a recent dealer survey rated our turntables #1 in value and performance.

Or the way our new separate tuners and amplifiers (not to mention micro components) utilize highly advanced light-weight pulse power supplies

whose levels of distortion are virtually unmeasurable.

Or how they use a NASA developed "Thermo-Dynamic Cooling System" that eliminates heat, excess wire and the distortion and interference that normally accompany them.

If you'd like to hear more about the complete line of Sony hi-fi components (or if you need the name of your nearest dealer) write us at 9 W. 57th St., N.Y., N.Y. 10019.

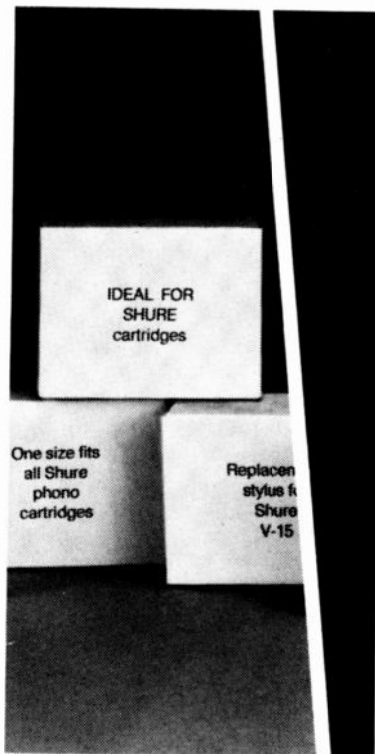
In the meantime, if somebody makes noise about innovations

in high fidelity, think of the biggest pioneer in audio. And remember Sony.

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We've never put our name on anything that wasn't the best.

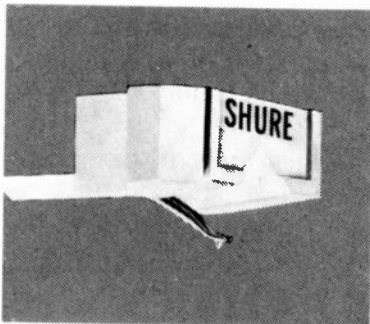
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## Needle in the hi-fi haystack

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Circle No. 45 On Reader Service Card

# A GUIDE TO RECENT STEREO RECORDINGS

by THOMAS D. KELLY

An avid record collector for nearly 20 years, 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 an Empire 39 transcription system with a Shure V15 III cartridge, a C/M Labs 911 stereo amplifier, a Marantz 7T pre-amp, and two Bozak B-400 speakers.

© Bizet: *Carmen*. Teresa Berganza (Carmen); Plácido Domingo (Don José); Sherrill Milnes (Escamillo); Ileana Cotrubas (Micaela); Yvonne Kenny (Frasquita); Alicia Nafe (Mercedes); and others, with the Ambrosian Singers, George Watson's College Boys' Chorus and the London Symphony Orch., cond. Claudio Abbado, Deutsche Grammophon 2709 083, three records.

This beautifully integrated performance of *Carmen* was made in conjunction with performances of the opera presented at the 1977 Edinburgh Festival. The advantages of a well-prepared production are ever apparent in this vivid interpretation, which still sounds remarkably spontaneous. The cast is strong in every way. Berganza has long been a specialist in music of this genre and offers a sophisticated, elegant heroine. Many listeners (and I am one



A beautiful Carmen

of them) might prefer a more fiery style, but there is no question of the validity of Berganza's approach. Domingo is the ideal Don José of the day, and Milnes is in equally good voice as

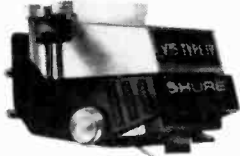
the swaggering bullfighter. Cotrubas offers an exquisite Micaela, and there can be nothing but praise for the exemplary playing of the London Symphony and the strong choral contribution. Abbado, one of the true perfectionists of today's younger set of conductors, pays scrupulous attention to detail, opting for propulsive tempi that sustain the dramatic action. This is a superior *Carmen* by any standards, and it has been beautifully captured by the DG engineers.

© Debussy: *Images, Sacred and Profane Dances*. Amsterdam Concertgebouw Orch., cond. Bernard Haitink, Philips 9500 509.

There's magic in *Images*, a remarkable score that imaginatively captures the essence of Spain, even though Debussy's physical contact with the country was practically non-existent. Even the music of Spanish composers doesn't quite capture the imagery of Spain, the colorful rhythms and richness of moods, with the same clarity as Debussy's music. "Iberia," the second of Debussy's three "images," here occupies the entire first side of an LP. I cannot imagine that anyone would be concerned that this second section is heard first, but those who might prefer to hear all three in their proper order could play "Rondes des printemps" from the second side, then "Iberia" on the first side, and afterward return to side two for the final section, "Gigues." The Concertgebouw Orchestra recorded "Iberia" years ago with Eduard van Beinum conducting, a performance recently reissued in the Philips "Art of Eduard van Beinum" album, a fine interpretation by any standards. Haitink's new version is even better, more evocative and always sensitive to the delicate, masterful orchestration. The Concertgebouw Orchestra is in virtuoso form, with some particularly felicitous wind playing. The lovely *Sacred and Profane Dances* are an appropriate filler. Phia Berghout, who recorded *Sacred and Profane Dances* almost three decades ago for Decca/London (with Van Beinum conducting) has had a very long association with the Concertgebouw and plays elegantly. Philips has done a superb engineering job, as the recording is extraordinary in its clarity, richness and breadth, although not with the incredibly wide dynamic range of a digital recording. This must be considered among the finest Debussy orchestral discs, and can be recommended without hesitation.

© Dvorak: *Symphony No. 8 in G, Op. 88*. Czech Philharmonic Orch., cond. Vaclav Neumann, Quintessence PMC 7119. *Violin Concerto in A Minor, Op.*

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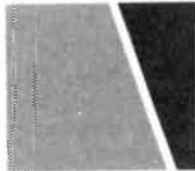
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**SHURE**

# STEREO RECORDINGS

53 *Romance, Op. 11*. Josef Suk, violinist, with the Czech Philharmonic Orch., cond. Karel Ancerl, Quintessence PMC 7112.

Both of these discs originated with Supraphon, but have been unavailable for sometime. Their reappearance is welcome, particularly at their bargain price. The Czech Philharmonic under Neumann gives a loving, idiomatic performance of the bucolic *Symphony No. 8*, although it is unfortunate that the important French horn acrobatics in the finale were not more clearly recorded. The symphony was taped in 1971, the violin concerto eleven years earlier, but the latter boasts the finest reproduction, with a splendid spacious quality and plenty of warmth. The solo violin, too, is balanced perfectly, and is not overly prominent, as often is the case with violin concerto recordings. Suk's performance of the concerto is virile, stressing the folk elements of the score, and this is the only budget-priced single-disc recording of this very attractive concerto.

© Grieg: *Piano Concerto in A Minor, Op. 16*. Percy Grainger, pianist; Sydney Symphony Orch., cond. John Hopkins, RCA Victor ARL1-3059.

The famed Austrian pianist studied Grieg's only piano concerto with the composer in 1907, and throughout his career Grainger championed this score, playing it for more than a half century. Grainger always wished to record the concerto with full orchestral accompaniment, but the occasion never presented itself. However, he did record it for Duo-Art piano rolls around 1920,



Player piano music

in a version that included orchestral parts played by the solo piano. This

new RCA LP offers the 1920 recording, edited to remove the orchestral accompaniment, which is provided here in stereo by the Sydney Symphony directed by Hopkins. The feat has been admirably accomplished, although the piano sound has a rather wooden quality that is not up to today's best piano reproduction. Grainger's conception is on a grandiose scale—not as exciting as some other pianists make it—and this performance is of interest primarily as a glimpse into the past. However, this LP is well worth owning, if only for the second side, which contains seven Percy Grainger favorites in special arrangements made by the pianist. Some of the compositions feature the pianist as soloist with Leopold Stokowski conducting a studio orchestra, and all were recorded in 1950. These are positively delightful, and the monophonic sound is beautifully balanced. Included are "Handel in the Strand," "Irish Tune from County Derry," "Country Gardens," "Shepherd's Hey," "Mock Morris," "Molly on the Shore" and "Early One Morning."

© Mussorgsky-Ravel: *Pictures at an Exhibition*. © Stravinsky: *Firebird Suite*. Philadelphia Orch., cond. Riccardo Muti, Angel S 37539. © Sibelius: *Four Legends, Op. 22*. Philadelphia Orch., cond. Eugene Ormandy, Angel S 37537.

Here are the initial two releases of this world-famous orchestra under their new association with EMI-Angel. This orchestra has had trying times from engineers who have attempted to capture their sound. After a long association with Columbia, which produced many magnificent recordings, the Philadelphia Orchestra switched to RCA more than a decade ago. The initial releases for RCA were an embarrassing technical disaster, although things improved, and in recent years some of the Philadelphia recordings have been quite acceptable, even if they never totally captured the true sonority and unique sound of this splendid orchestra. Angel chose as their recording site the old Metropolitan Opera House of Philadelphia; it was there that Stokowski and the Philadelphians gave the American premiere of Schonberg's *Gurrelieder* in 1932. The engineers seemed quite pleased with the potential of this hall as a recording site, and generally they have been successful. The sound on these records is clear, quite rich and spacious, although there is to my ears insufficient impact to the low percussion, and high frequencies could have more sizzle. Still, the tonal quality is superior to that achieved by RCA's engineers, and the performances themselves are superb. Muti's reading of "Pictures" is kaleidoscopic in its rich

orchestral tapestries, and "Firebird" has moments of rare tenderness. Sibelius' *Legends, Op. 22* is a fascinating score that tells of some of the exploits and adventures of Lemminkäinen, a hero of the Finnish national epic "Kalevala," including as the second of its four episodes the familiar "Swan of Tuonela." Ormandy recorded the Sibelius *Legends* years ago monophonically for Columbia, and has long been a specialist in the composer's music. This new performance is quite glorious, easily outclassing the competing versions.

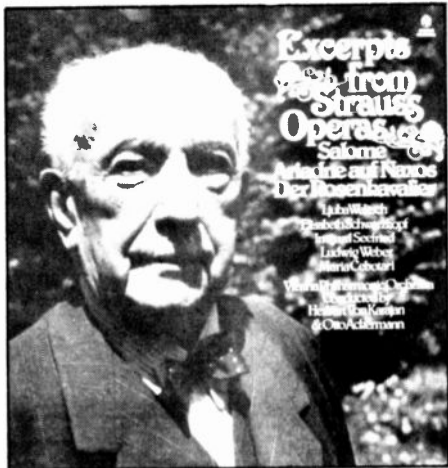
© Puccini: *Tosca*. Mirella Freni (*Tosca*); Luciano Pavarotti (Mario Cavaradossi); Sherrill Milnes (Baron Scarpia); Richard Van Allan (Cesare Angelotti); Michel Senechal (Spoleto); Paul Hudson (Sciarrone); Wandsworth Boys' Choir; London Opera Chorus; National Philharmonic Orch., cond. Nicola Rescigno, London OSA 12113, two records.

London surely has the most complete and exciting opera catalog of all labels, but its prestige is not enhanced by this standard recording, which finds one of the principals dreadfully miscast, the other on an off-day. Pavarotti, of course, is today's tenor supreme, with a voice of sterling beauty, impeccable intonation and seemingly limitless power. His Cavaradossi is magnificent. How sad that his associates are not of equal calibre. Freni's light voice is hardly appropriate for *Tosca*. She must force at the top, and the lower declamatory passages are hardly convincing. Her *Tosca* is inconsequential compared with the majority of other sopranos who have recorded the role. Milnes was a highly respectable Scarpia in an early recording with Leontyne Price and Plácido Domingo. Here he has moments of power, but this interpretation does not reach his own earlier standard, much less those set by Gobbi, Wixell and Warren on competing recordings, with a particularly disappointing "Te Deum." The engineering definitely favors the singers, mercilessly in the spotlight, and much of the rich orchestral score is lost. Rescigno's direction is undistinguished, and this *Tosca* is only for admirers of Pavarotti. If you are in the market for a recording of *Tosca* do not overlook the recent Philips set featuring Caballé, Carreras and Wixell with Colin Davis conducting, or the first Leontyne Price recording with Di Stefano and Taddei, Karajan conducting. Perhaps the best buy of all is the RCA set with three top singers of the past, Zinka Milanov, Jussi Bjoerling and Leonard Warren, all in fine voice.

© Strauss: *Excerpts from Salome, Ariadne auf Naxos and Der Rosen-*

kavalier. World Records SH 286 (mono).

There are some incredible treasures here for the collector. World Records, a subsidiary of EMI, seems to be re-issuing all of the earlier Karajan recordings, and this is one in that series, although one of the cuts is conducted by Otto Ackermann. Of particular interest here is the return to the catalog of this positively glorious performance of the "Presentation of the Silver Rose" from Act II of *Der Rosenkavalier* with Elisabeth Schwarzkopf (who later became the perfect Marschallin), an exquisite Sophie and Irmgard Seefried a rich Octavan. Also included is the Act II Finale with Ludwig Weber and Dagmar Hermann, with Acker-



#### Opera gems

mann conducting. All admirers of soprano Ljuba Welitsch will wish to have this record as it contains the often talked about but heretofore never released final scene from *Salome*, recorded with the Vienna Philharmonic in 1948, one year before the soprano's sensational Metropolitan Opera debut in the same opera. Unfortunately, the second side of the four original 78 RPM discs was damaged and could not be included, so at that point the engineers have left a brief pause in the music. Even minus a few minutes, this is a unique performance, with Welitsch easily able to accommodate Karajan's expansive treatment. Another treasure is the aria "Es gibt ein Reich" from *Ariadne Auf Naxos*, recorded by another Strauss specialist, soprano Maria Cebotari. Operaphiles will insist on owning this interesting disc, and probably will not be too bothered by the lack of texts.

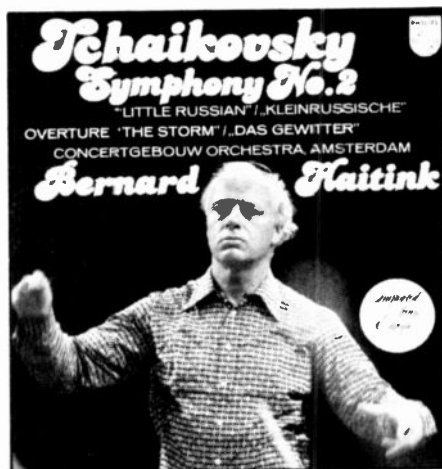
© Tchaikovsky: *Manfred Symphony*, Op. 58. Philadelphia Orch., cond. Eugene Ormandy, RCA Victor ARL1-2945.

Ormandy and the Philadelphians are a natural for this remarkably colorful score based on Byron's *Manfred*. *Manfred* is among Tchaikovsky's most con-

vincing works, with the protagonist represented by one of the composer's finest themes. The second movement, the scherzo of the symphony, is gossamer in its lightness and quicksilver moods, reminiscent of Berlioz's "Queen Mab Scherzo" written almost a half-century earlier. The final Bacchanale offers some tremendous orchestral frenzies, with the full orchestra joined by an organ at the climax. *Manfred* is already well-represented on recordings in versions conducted by Maazel, Rostropovich, Rozhdestvensky and Svetlanov. This new Ormandy set interpretively offers much, but sonically is decidedly substandard. The famed Philadelphia strings here are quite thin, bass is undefined and murky, and there is a decided lack of brilliance to the overall aural atmosphere. Too bad, for this could have been a winner.

© Tchaikovsky: *Symphony No. 2 in C Minor, Op. 17 Little Russian; The Storm, Op. 76*. Amsterdam Concertgebouw Orch., cond. Bernard Haitink, Philips 9500 444.

Haitink and his orchestra already have to their credit sterling recordings of Tchaikovsky's final three symphonies, and are now starting on the lesser-known initial three. This version of the charming *Little Russian* symphony is broad in scope, immaculately played, and magnificently recorded, with the resplendent sound of the lower Concertgebouw strings particularly opulent. Sturdy though this is, one might wish for a more dynamic view from the conductor: the music does not approach the excitement of the recent Muti-New Philharmonia Orchestra Angel disc, or the impassioned approach of Mstislav



#### Lacks vitality

Rostropovich and the London Philharmonic on the same label, the latter available now only as a part of the 6-LP album. Haitink's filler, the seldom heard overture to *The Storm*, is one of the composer's least engaging efforts, although Haitink and the Concertgebouw make a strong case for it. I en-

joyed this new recording for its rich sonics and beautiful orchestral playing, but Tchaikovsky's *Little Russian* can be a more invigorating listening experience than it is here.

© Tchaikovsky: *Symphony No. 4 in F Minor, Op. 36*. Berlin Symphony Orch., cond. Kurt Sanderling, Denon PCM digital recording OS-7137-ND.

The prospect of a digital recording of a Tchaikovsky symphony is an appealing one, yet this turns out to be a disappointment. The digital recording process does provide some very wide-range dynamics indeed. The sound is ultra-clear, and I particularly enjoyed the remarkable clarity of the pizzicato strings in the Scherzo. The problem here, as with many digital and direct-to-disc recordings, is that the recording site was not suitable acoustically. This is a dry kind of sound, without any rich hall ambience, and the overall effect is hardly attractive to the ear. The bombastic opening of the finale is a case in point. One should hear the blaze of rousing percussion and swirling strings within a total symphonic framework, quite absent in this recording. Sanderling's interpretation is not particularly impressive, and similarly, the quality of orchestral playing, prosaic. There are countless other competing versions of this popular symphony that, even though not digitally recorded, are far more attractive to listen to, and they cost about half as much, particularly interpretations by Barenboim, Bernstein, Haitink and Karajan.

© Prokofiev: *Piano Concerto No. 1 in D Flat, Op. 10*; © Ravel: *Concerto for the Left Hand*. Andrei Gavrilov, pianist, with the London Symphony Orch., cond. Simon Rattle, Angel S 37486.

Gavrilov, the latest young Soviet sensation who won the Tchaikovsky Competition at 18 years of age, has often been called "a young Horowitz." He creates a sensation whenever he plays, and is remarkably impressive on this coupling of Prokofiev and Ravel. His playing of Prokofiev's precocious youthful concerto is stunning by any standards, with wit and sensitivity as well, while I don't recall ever hearing a finer performance of Ravel's unique concerto. Simon Rattle, although another youngster on the major musical scene, provides a concise accompaniment. The London Symphony plays brilliantly, and the engineers have done their work well. The LP is filled out with solos by Gavrilov, Ravel's "Pavane for a Dead Princess" and two brief excerpts from Prokofiev's "Romeo and Juliet." This is a major recording debut.

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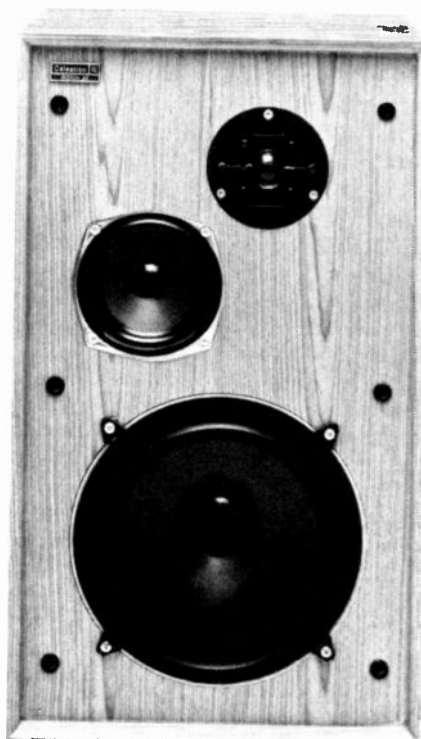
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### Ditton 33

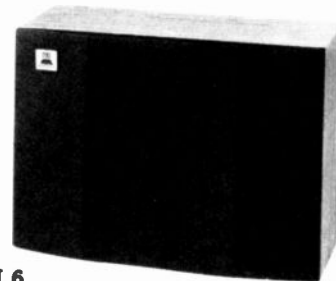
For exceptional performance, this compact speaker system employs a sealed enclosure, high compliance woofer, a transmission-line loaded mid-range speaker, and a pressure-dome tweeter (the HD

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### UL 6

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HI-FI/STEREO BUYERS' GUIDE



# TURNTABLES AND PHONO CARTRIDGES

FINDING A GOOD MATCH IS NOT AS EASY AS IT MIGHT SEEM

by WILLIAM S. GORDON

It has always struck me as perverse the way high-fidelity components that are rather easy to marry—tuner, preamp, and power amp—are often bought as an ensemble we call a receiver. Components that mate with much more difficulty—the turntable and cartridge—are bought separately and frequently with little regard as to how well they get along. True enough, there are record-playing systems assembled by the manufacturer—the Stanton 8005 and the new Duals with ULM arm and cartridge come to mind—but these have been the exception rather than the rule. Some hi-fi

retailers sell the record player and cartridge as a package, but have they been matched for technical compatibility or on the basis of economic considerations? Some combinations I've seen sure seem to have been made with more attention paid to the latter!

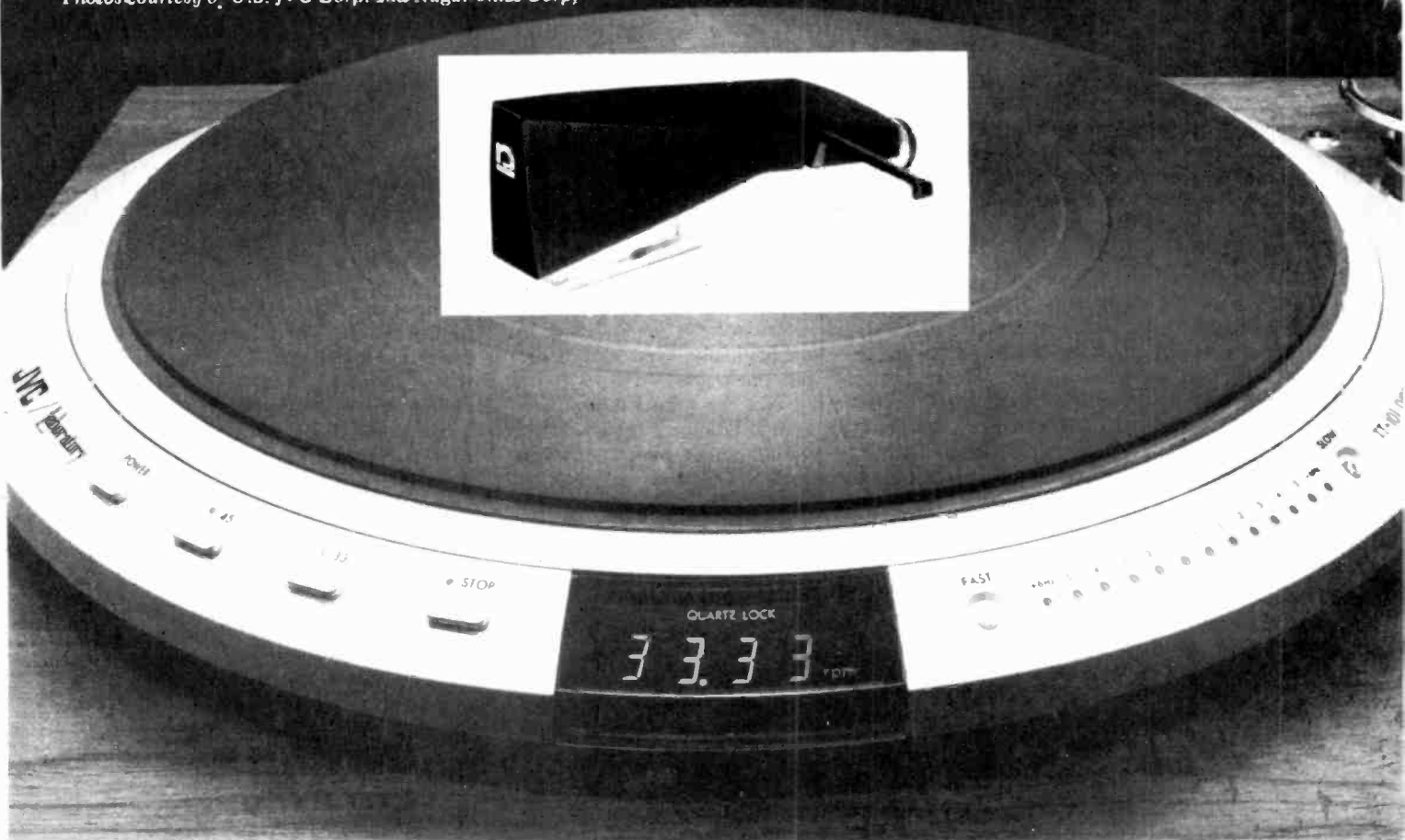
Perhaps part of the reason for the preponderance of "separates" in record-playing equipment is that people have widely disparate views of what they want in a turntable and in a cartridge. Should you buy a manual, semi-automatic, fully-automatic, or changer? A moving-magnet, moving-iron, or moving-coil pickup?

## Turntable Types

There was a time when no audiophile worthy of the name would buy anything other than a manual platter. The choice was between a strictly manual turntable or a changer with undersized (8-inch or 10-inch) platter in those days. Fortunately, that's all history now, and there's no reason why you can't have some degree of automation and top performance as well.

Turntable terminology is less than precise and everyone doesn't mean the same thing by the same words. On the whole, however, "manual" means a system with which you must position

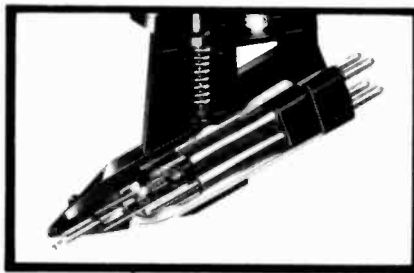
Photos courtesy of U.S. JVC Corp. and Nagatronics Corp.



# TURNTABLES AND PHONO CARTRIDGES

the tonearm above the lead-in groove, lower it to commence playing, raise it at the end, and return it to its rest. A "semi-automatic" usually denotes a system in which the arm is at least raised (and usually returned to the rest) after the side has been played. You do the initial positioning and lowering. A fully-automatic system finds the lead-in groove by itself (although usually you must set a switch to tell it the size of the record) and raises and returns the arm at the end of play. Such systems can usually also be set for continuous replay of the disc.

The above are all "single-play" systems. A changer accepts a stack of records and plays one side of each in sequence. Obviously, such a system can also be used as a fully-automatic single-play. Given the quality of today's turntable-drive systems, you can get excellent performance with either a changer or a single-play. The drawbacks of the changer are as much practical as they are theoretical. A warped record in the stack—and what stack of records doesn't have one or more dish-shaped discs—perturbs the motion of every record on top of it. And unless complicated designs are used to raise the level of the arm a bit for each additional record, the arm will not be equally level for each record, and the vertical tracking angle will be off. So unless you have particular



Dual's 731Q direct-drive automatic single play turntable includes an ultra-low-mass (ULM) tonearm. Ortofon's ULM 60E cartridge was designed especially for use with this tonearm, and the two together have a total effective mass of only 8 grams. Turntable price is \$559.95; with pickup included, \$699.95. Write Dual directly for details: 120 S. Columbus Ave., Mt. Vernon, NY 10553.



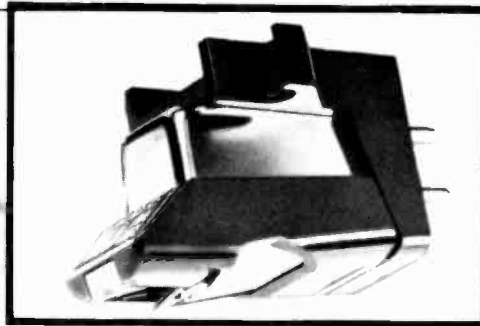
need for the automatic changing function, you're probably better off with a single-play. Since the latter is less complicated mechanically, you get more turntable per buck, too.

Assuming you can afford it, my personal recommendation is to go for a fully-automatic single-play. Modern arm-lift mechanisms are exceedingly gentle and add no extra drag on the arm while it's playing the record. Unless you have the hands of a surgeon, the machine will handle the arm more deftly than you will be able to, and so the probability of accidents is minimized.

## Turntable Drive Systems

The two most common means of spinning the platter are the so-called

"belt-drive" and the so-called "direct-drive" systems. The names are self-explanatory. In a belt-driven system, a medium to high-speed motor is coupled to the rim of the platter or to that of a sub-platter by a flat belt. The soft belt helps to filter out motor vibrations and so reduces this cause of rumble. In a directly-driven system, a slow-speed motor is used, and the rotor is either part of the platter itself, or is directly attached to the spindle. Although there is little rumble filtering provided by such an arrangement, little rumble is generated by the slow-speed motor to start with. Since the motor turns so slowly, any vibrations that occur are at subsonic frequencies and can't be heard.



ADC's 1700DD is a direct drive, quartz-locked, semi-automatic turntable that includes a low-mass, straight-arm tonearm. \$250. The ADC XLM Mark III phono pickup cartridge is well-suited for the 1700DD. Its weight is 5.75 grams, while its recommended tracking force is  $\frac{3}{4}$  to  $1\frac{1}{2}$  grams. \$110. Circle 61.

Garrard's DD131 direct-drive semi-automatic turntable incorporates a brushless, slotless, coreless motor designed to eliminate cogging problems and a J-shaped tonearm. \$190. Circle No. 70. Empire's 2000 E/III phono pickup cartridge has a recommended tracking force range of  $\frac{3}{4}$  to  $1\frac{1}{2}$  grams. Its price is approximately \$70. Circle Reader Service No. 122 for further details.



Mitsubishi's DP-EC20 is an electronic, IC-logic-controlled turntable which sells for about \$520. It may be linked with Mitsubishi's DT-30 cassette deck for remote control operation. Circle 78. Pickering's XSV / 5000U phono pickup cartridge has a recommended tracking force of  $\frac{1}{2}$  to  $1\frac{1}{2}$  grams. \$225. Circle Number 123.



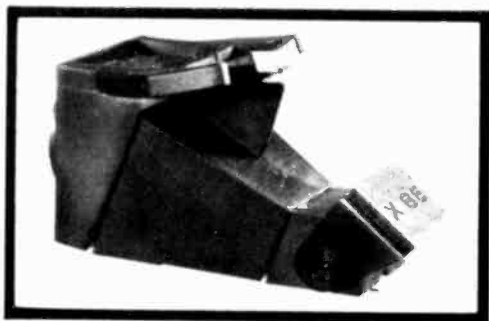
Suffice it to say that excellent turntable systems can be designed using either approach. Servo controlling the platter speed is simpler with the direct drive, and, of course, there's no belt to wear out. So many audiophiles prefer the direct drive to the belt drive. Furthermore, since the direct-drive motor is not energized directly by the power line, it is free of the speed perturbations that surges in line voltage can induce. (Some belt-driven platters also use a servo-controlled motor rather than the old induction or hysteresis-synchronous motor.) With a servo-controlled motor, it's also easy to provide a smooth control of platter speed merely by changing the servo reference. So speed verniers are now quite common. Quartz lock has also found its way into turntables, and it assures absolutely precise platter speed.

Besides considering the convenience at its technical specifications before features offered by the turntable, look making a final decision. Key among these are rumble, flutter, and speed accuracy. Comparison of specs is anything but simple. There are various "rumble-weighting" curves in use—DIN A, DIN B, and ARLL to name three. The CBS-derived ARLL is probably the one closest related to the audibility of rumble, yet manufacturers prefer to use the DIN-B standard that yields superb (albeit meaningless) figures. Flutter can be measured in accordance with DIN standards (the same as has been adopted by the IEEE and ANSI) or by the "weighted-rms" (WRMS) method. The latter produces the better-looking numbers. Speed accuracy is the least important spec, and it's rare to find a turntable that is off far enough to be noticeable by the average listener.

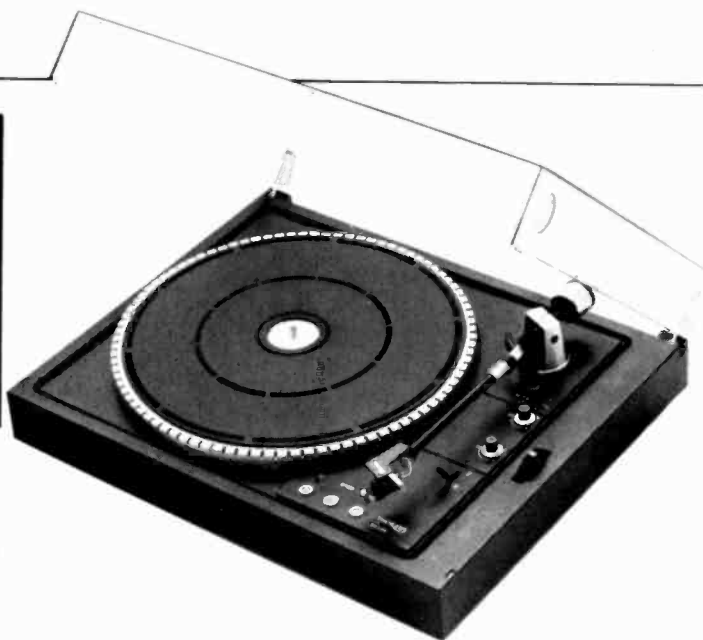


Philips 677 semi-automatic turntable includes a straight tonearm and a direct-reading stylus force gauge. \$150. Circle No. 84. Shure's M95-HE phono pickup has a recommended tracking force range of  $\frac{3}{4}$  to  $1\frac{1}{2}$  grams. \$90. Its stylus may be purchased separately for \$34. Circle Reader Service Number 93.



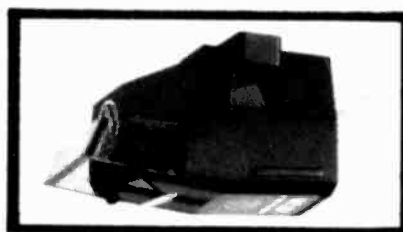


Thorens's TD-104 belt-drive manual turntable includes an isotrack plug-in tonearm—a light-weight straight tubular design which incorporates the headshell. \$285. Write Thorens for details at Thorens and Atlantic Avenues, New Hyde Park, NY 11040. AKG's P8E phono cartridge has a tracking force range of  $\frac{3}{4}$  to  $1\frac{1}{4}$  grams, with 1 gram suggested as optimal. \$100. Circle Number 63 for further details.



## TURNTABLES AND PHONO CARTRIDGES

Technics SL-Q2 is a direct-drive semi-automatic turntable that includes a universal S-shaped tubular tonearm. \$200. Circle Number 98. Audio Technica's AT30E is a moving-coil phono pickup with user-replaceable stylus. \$100. Circle R. S. Number 124.



### Cartridge Compatibility

Now comes the difficult part—matching a cartridge to the system. For optimum results, the cartridge must be compatible with the system in three ways: physically, mechanically, and electrically. Physical compatibility is not usually a problem, but it's not unknown to find a headshell that is too small to accommodate a particular cartridge. Or perhaps there is some interference between the cartridge case and the shell so that it can't be mounted properly. Or the cartridge may be too light or too heavy to be balanced by the counterweight. Or there might be insufficient adjustment range in overhang or tonearm height to accommodate a particular cartridge. Better to doublecheck this before you buy and be safe, rather than sorry.

Electrical compatibility requires that the capacitance of the turntable leads not be excessive. Determining compatibility is complicated by the fact that the preamp input capacitance must also be factored in, and, frequently, this is unknown. In general, each moving-magnet or moving-iron cartridge requires a specific load capacitance to work as it should. (Moving-coil cartridges are of low impedance and generally aren't finicky about the load

capacitance.) The sum of the tonearm-lead capacitance and the preamp input capacitance should equal that required by the cartridge. If the sum is too low, external capacitance can be added to bring the total up to the mark, but, if the sum of the turntable-wiring and preamp-input capacitance is too great, nothing can be done to reduce it. So, in general, choose a turntable with low lead capacitance, and you won't limit your choice of cartridges.

Even more problematic is mating the cartridge compliance with the mass of the tonearm—a must to assure good trackability of warped records. The cartridge-stylus compliance (springiness) resonates with the tonearm mass at some low frequency, and, at that frequency, the system is highly susceptible to vibration that is induced either by a warped record or by transmission through the suspension. The resonance

cannot be eliminated entirely, although its effect can be minimized by proper damping. This is the reason for viscous damping (as, for example, is used on the SME 3009 Series III arm). Damping can also be added via a brush appendage at the cartridge (for example, the Shure V-15 Type IV and the Stanton and Pickering cartridges) or via an add-on damper such as Discwasher's Disctraker.

Research has shown that the majority of record warps occur at frequencies in the vicinity of 4 Hz and that the ideal tonearm/cartridge resonant frequency is in the neighborhood of 10 Hz. Few tonearm/cartridge systems resonate at this high a frequency, for to do so means either a low stylus compliance—which implies poor trackability in the music region—or very low effective mass (and that's not easy to get).

The tonearm mass can be reduced  
(Continued on page 81)

# Professional Sound Systems Start With The Stanton 881S

Stanton Magnetics presents the new 881S Professional Calibration Standard Cartridge. It's the cartridge preferred by recording engineers worldwide and it assures a new standard for home audiophiles desiring the very best in recorded sound. Its patented, low mass Stereohedron™ stylus

tip makes possible the flawless reproduction of high velocity modulations present on today's finest recordings.

The Stanton 881S... where great sound begins. Stanton Magnetics, Terminal Drive, Plainview, NY 11803

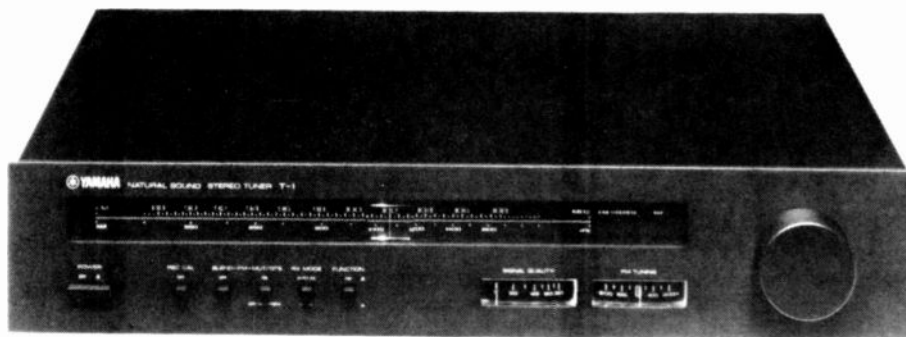


**STANTON**

THE CHOICE OF THE PROFESSIONALS™



## YAMAHA AM/FM STEREO T-1 TUNER



### INCORPORATES A REALLY OUTSTANDING DEVELOPMENT IN FM TUNER DESIGN

□ Every once and a while stereophiles run across a new idea that makes them wonder why it hadn't been done before. In most instances it will turn out that the idea is umpty-ump years old, but to do it years ago would have taken a shelf full of vacuum tube circuits and enough electric power to heat the house for most of the winter.

A case in point is the Yamaha T-1 AM/FM stereo tuner, which features *automatic bandwidth control* of the FM IF amplifier. Using modern technology it was possible for Yamaha to pull off one of the really outstanding developments in FM tuner design. Five years ago Yamaha probably would never have attempted the idea because the number of discreet—as opposed to integrated—circuits required would have made costs prohibitive in a consumer FM tuner.

Without getting into the technical nitty-gritty, a broad-bandwidth IF amplifier results in less distortion of the FM tuner's output signal than an FM tuner with a narrow-bandwidth (high selectivity) IF amplifier. On the other hand, a broad-bandwidth IF amplifier is more susceptible to interference from signals on adjacent, alternate, and second alternate channel spacing. This is particularly true if the interfering station on the alternate (and second alternate) channel is stronger than the desired (tuned) signal. (It is a rare tuner that can prevent interference from adjacent channel signals.)

Since hi-fi tuners generally feature *acceptably low* distortion values in conjunction with *good selectivity*, some form of effective compromise has obviously been made. Basically, the compromise involves cost, because we can make a super-selective FM tuner with

exceptionally low distortion, but few stereophiles could afford to purchase one. As a general rule, one cannot have excellent selectivity in conjunction with low distortion at a moderate price. The two have never gone hand in hand—until now, that is.

Utilizing a clever switching system, Yamaha has come up with a design that normally provides fair selectivity coincident with exceptionally low distortion: a measured 0.07% THD + N (total harmonic distortion plus noise) for stereo. When a special *interference detector circuit* senses a high noise level, as might be caused by a weak signal, or "splash" interference noise from adjacent/alternate channel signals, a high selectivity filter is automatically switched into the IF amplifier. The stereo distortion rises to somewhere around 0.22%; the exact value cannot be measured because the tuner automatically switches to the low distortion/widebandwidth mode at standard test levels (see the test report in this issue). A THD of 0.22% for stereo is still a respectable value, few tuners can match it; but more important, the selectivity becomes razor sharp, eliminating the "splash" and noise interference.

The user need make no adjustments as he or she tunes the FM band, for the tuner automatically switches to the best operating mode for the specific reception conditions of the desired signal.

How this magic is accomplished looks very easy on paper, and it really is, as long as modern solid-state technology is available. The T-1's IF amplifier has a basic filter that provides what we consider "good" selectivity. In series with the IF amplifier is a super-selective filter. When an interference detec-

tor senses "noise" in the tuner's output it causes the electronic switch to open, forcing the FM IF signal to pass through the super-selective filter. As soon as the interference detector senses a lack of "noise" it restores the electronic switch bypass and the tuner returns to the wideband/low-distortion mode.

The rest of the T-1's features are more or less common for a high quality FM tuner. They include FM center channel and AM/FM signal strength meters, a *record level check* that provides a tone output equal to nominally 50% modulation of an FM transmitter (useful for preadjusting Dolby tape recorders for recording FM Dolby stations), and fixed and variable line level outputs. One oddball feature is an interesting FM-AM antenna splitter that uses the FM antenna for the AM tuner. This means that if you have an outdoor FM antenna you also have an outdoor AM antenna. As you might expect, not only can AM sensitivity be exceptionally high, but one does not bother to incorporate this type of circuitry in other than the best of equipment. The T-1's AM performance is about the best we've seen or used.

We wish we could say the same for the instruction manual. It is, at best, confusing, and has too much detail on features not important enough to mention here. Why this was done to an otherwise outstanding tuner is beyond our understanding, for both our lab and listening panel rates the T-1 sound quality as absolutely superb.

For more information on the Yamaha T-1 AM/FM Stereo Tuner, which sells for \$365, circle Reader Service Card number 101. ▲

# FALL FORECAST



A PREVIEW OF THE  
HI-FI INNOVATIONS  
YOU'LL BE SEEING  
IN NEW PRODUCTS  
FROM NOW ON

## TURNTABLES

## TAPE MACHINES

## RECEIVERS & TUNERS

## SPEAKERS

by FRED PETRAS

**W**hen you step into your local hi-fi shop this fall you may be startled by the "new look" of the equipment. You'll see an array of equipment with flashing spots of light, glowing numerals, and many "faces" unlike those you've associated with audio equipment of the past.

The foregoing is a general summary of what audio journalists previewed at the Summer Consumer Electronics Show, one of two major annual audio events. As usual the show was a vast expanse of offerings from every segment of the audio industry. And as usual, it highlighted what was new—the latest, the last word, the state-of-the-art. And that's what this article is all about.

### TRENDS AT A GLANCE:

- **Micro Components**—Microcomponents *per se* have been added to several manufacturers' lines and evidence of their impact on the industry is noticeable in many other lines via a slenderizing and down-sizing of many regular components.

- **Receivers**—More models include DC and/or high speed amplifiers. New tuning approaches and digital station readouts are favored. LED power readouts are prevalent in place of meters. Slimmer units are emphasized in some lines, while somewhat smaller models are to be found in other lines.

- **Tuners**—Quartz-locked tuning, digital readouts of station frequencies

as well as time readouts, more slim-line profiles, station pre-set capability and automatic tuning are all coming on strong. LED tuning and signal strength indicators predominate in place of the usual meters with needles.

- **Amplifiers**—DC and high speed are the buzzwords. LED power meters are burgeoning. Integrated models often sport moving coil cartridge inputs.

- **Preamplifiers**—More include moving coil cartridge inputs. More slim-line models and better signal-to-noise ratios are evident.

- **Turntables**—A virtual takeover by models with front controls. Many more quartz-controlled units. A burgeoning of straight tonearms. Digital speed readouts are increasing.

- **Cassette Decks**—A deluge of meta-tape-capable models. More sets with microprocessor memory programming and selection capability. More slim-line units to match other thinner components. Easier-access loading systems. Accent on LED, fluorescent, liquid crystal readouts. Additions to the two-speed category. A half-speed hi-fi deck from Nakamichi.

- **Speakers**—More vertical models. More minis. More subwoofers, many designed for use with mini satellites. A technological development by KLH brings better bass from smaller systems.

**A Closer Look.** "Micro components are the wave of the future. At Toshiba the future is now." This headline in an

## TURNTABLES

# 1979



Technics SP-15 turntable incorporates quartz synthesizer pitch control and direct-drive technology. Features include locking mechanism to prevent misoperation. \$600. Circle Number 98.

Mitsubishi's latest introduction, the DP-EC7 direct-drive automatic turntable sells for about \$350 and includes photoelectric record size sensors and a repeat function. Circle Number 78.



Sansul's XR-Q9 fully automatic direct-drive turntable includes a straight "Dyna Optimum Balanced" tonearm and construction designed for increased acoustic isolation. \$500. Circle 89.

AIWA's new \$1200 turntable, dubbed the LP-3000U, features a linear trace arm, automatic programming capability, and LED digital speed readout, among other goodies. Circle No. 128.



audio business publication nicely sums up Toshiba's attitude toward micro components, coming on the heels of the firm's debut of a new group of such equipment at prices lower than Toshiba's first micro offerings. The new models are: A10, 20 watts-per-channel (wpc) integrated amplifier at \$300; T10, AM/FM stereo tuner at \$250; C12, control amplifier at \$230; M12, 30 wpc power amp at \$280; and D15, cassette tape deck at \$550.

JVC's new micro offerings are the AM-1, 50 wpc integrated amp at about \$600; and the TM-1, a digital quartz-locked tuner priced at about \$500, featuring five station presets, frequency scan tuning, and digital display that shows time when not used for tuning.

AIWA's entry into the micro component field consists of four models, as follows: SD-L22U cassette deck, eight inches wide, 2 $\frac{3}{8}$  inches high and 6 $\frac{1}{2}$

inches deep—perhaps the smallest deck in the entire industry at \$280; SA-R22U tuner with four-LED signal strength meter at \$200; SA-P22U, 30 wpc DC stereo amplifier with five-LED output display at \$210; and SA-C22U preamplifier at \$140.

Sony's entry into micro components centers around three matching units—the ST-P7J tuner, TA-P7F 50 wpc integrated amp; and the SP-P7X turntable, at prices not determined at press-time. The units can be laid out on a horizontal plane to cover a span of 34 inches, or the 17-inch wide turntable can be placed atop the two side-by-side components, each measuring 8 $\frac{1}{2}$  inches wide.

Randix adds a 15 wpc integrated amp, a tuner, and a graphic equalizer to its micro line. The trio will sell in the \$330 to \$400 price range.

Receivers. Overall, receivers were the

category that got the most attention at the Summer CES—and the largest number of additions. Many companies offered new models with DC amplifiers, with LED power level readouts in place of meters, tuning sections with digital station frequency readouts and quartz lock tuning, with LEDs replacing tuning and signal strength meters. Considerable attention is being paid to control placement in order to provide easier, more logical operation for consumers. Generally, this all adds up to a fresher, more sparkling look.

A number of companies, some inspired by micro component technology, but not yet ready to totally embrace it, have decided to down-size some of their new receivers—to attract space-conscious shoppers in the same state of mind. Among such companies are Rotel, with a 35 wpc unit in its Macro 1000 Series, priced at \$300 (as well



## TAPE MACHINES



TEAC's new A-430 cassette deck includes an automatic bias circuit that determines a precise optimum bias for any normal, chrome, or metal tape that it's fed. \$500. R. S. No. 10.



Sharp's RT-4488 microprocessor-controlled cassette deck includes metal tape capability and APLD (which enables you to play tape selections in any order you choose). \$500. No. 127.



Hitachi's new D753 slimline cassette deck includes 4-position tape selector (including a position for metal tape), fluorescent bar-graph-type meters, and auto-rewind, \$400. Circle No. 72.



Akai's GX-255 real-to-reel tape machine is a budget-priced deck (\$650) that accommodates 7-inch reels and offers an auto-reverse playback feature. Circle R. S. No. 52 for details.

as five separate components); Hitachi with a 15 wpc receiver at \$200, a 25 wpc model at \$250; and Orkyo with its flip-panel 30 wpc TX20, priced at \$330.

Optonica has also hopped on this bandwagon with a series of slim-line "pancake" separate components—each measuring 2.5 inches high. The series consists of two integrated amps, a pre-amp, power amp, and three tuners, ranging from \$250 to \$1,000. The \$1,000 unit is a digitally synthesized tuner featuring digital frequency display, memory for 10 stations and auto search system. It also has air-check calibrator, 12-LED signal strength meter, 3-LED tuning meter, and variable output terminal, among other features.

Two receivers from SAE are said to be the "first ever to feature a complete two-band parametric equalizer built right into the unit." The sets are the

SAE Two Model R18 at \$1,350, and the Model R12 at \$1,100. SAE explains that in addition to providing tonal cuts and boosts as in conventional graphic equalizers, this advanced form of tone control also allows the user to precisely define the bandwidth and frequency at which these level changes are made. The sets' parametric circuitry can be switched to equalize either the line source, or the tape outputs. The two quartz lock, digital readout units, plus the new SAE Two Model R9 at \$300, also feature varactor touch tuning with automatic scanning and four-function fluorescent metering system.

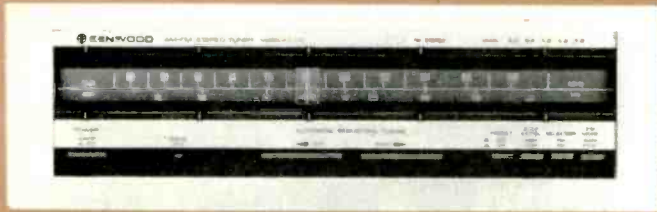
**Amplifiers.** More power in a smaller, lighter package than has previously been possible is Sanyo's major claim for its Model Plus 55, 100 wpc power amp, priced at \$350. This is accomplished with an unusual twist—use of a fluid convection radiator, a system in

which transistor heat boils from contained in sealed loops to a gas, which rises, condenses, and returns for reuse. In the process, the loops dissipate heat transferred by the gas as it returns to its liquid state. The system cuts the weight of heat sinks by 80 per cent, says Sanyo. Another twist is the amp's power indicator, in which 12 LEDs per channel move up and down diagonal scales to indicate power peaks.

High-speed technology in amplifier circuits—to cut transient intermodulation distortion and improve mid and high frequency reproduction in powerful complex or percussive musical passages, is a feature you'll be hearing more about, thanks to the efforts of Kenwood in promoting this technology. It is featured in a new Kenwood integrated amplifier, Model KA-601 at \$399, along with four receivers—Models KR-9050, 8050, 7050 and 6050, at

## RECEIVERS & TUNERS

# 1979



Kenwood's KT-413 tuner includes automatic sequential tuning, which locates stations, fine-tunes and locks onto the point of maximum signal strength and minimum distortion. Circle 75.

Onkyo's new TX-20 30-watts-per-channel "mid?" receiver includes Servo-Lock tuning circuitry and a disappearing control cover panel. \$330. Circle Reader Service No. 30 for details.



SAE's Model R12 (in its SAE Two line) is a 120-watts-per-channel receiver with quartz-lock tuning, digital readout, and built-in parametric equalization (2-band). \$1100. Circle No. 88.

Nikko's NT-790 AM/FM tuner features thin-line styling, high blend filter, FM muting circuitry and a rack-mounting option. Price is about \$180. Circle Reader Service Number 79.



\$1,150, \$620, \$660, and \$499, respectively.

High-speed amplification also figures prominently in the Sansui line, via two integrated DC amplifiers, a DC power amplifier and a matching preamp. The amps feature slew rates of 200 to 260 V/microsecond, the preamp 50 V/microsecond.

Also notable: Vertical fluorescent power level meters in Philips' Models AH901 and AH903 receivers, priced at \$550 and \$750, respectively.

**Tuners.** The Summer Consumer Electronics Show was the debut point for a number of tuners (and tuner sections in receivers) with automatic tuning capability "to reduce wear and tear on fingers and eyes" as one industry wag put it. Kenwood, for instance, offered its Model KT-413, featuring automatic sequential tuning, which, by depressing one of two directional tuning bars first locates the station, fine-tunes it to the point of maximum signal strength and minimum distortion, and then locks it into position until either tuning bar is depressed again.

If you want to move up and down the tuning dial at random, it scans the dial completely. It sells for \$250.

The KT-413, via its pre-select feature, also makes it possible to automatically tune up to five preselected AM and five FM stations.

Preselect capability is also offered by Sony in its ST-160 FM-only tuner priced at \$400. This unit offers three means of selecting stations; manual tuning buttons are used to step up or down the FM scale in 0.1 MHz intervals; auto tuning can scan the FM scale to the next available station; or memory tuning allows preselection of up to eight different stations for instant activation. All these modes are operated with feather-touch controls.

One of the most intriguing new tuners at the Show was Sanyo's quartz locked Model T35 in its "Plus" series. It features a dual-mode frequency display, called "Digital Plus," which consists of a conventional dial scale with illuminated pointer and a bright fluorescent digital frequency display which travels along with the pointer as you

tune the set, thus combining the convenience of analog tuning with the precision of digital tuning. Conventional tuning meters are replaced in the Plus T35 by an array of LEDs. The unit will sell for \$300. Digital Plus tuning is also employed in four new Sanyo receivers, the Plus 55, 70, 130 and 200, rated at 55, 70, 130 and 200 watts per channel, and priced at \$400, \$550, \$700 and \$900, respectively. The Plus 200 is additionally unusual in that it is a "docking" set, which enables the user to separate the tuner/preamp from the power amp for greater placement flexibility.

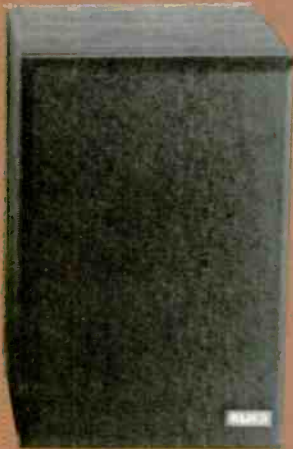
**Preamplifiers.** Growing more slender or compact with each audio show preamplifiers at the same time are offering more features. An example is Yamaha's new C-6, priced at \$450. In addition to a built-in head amp for moving coil cartridges, the unit also has a "Parametric Tone Control" system, enabling the user to control three important parameters of tone control over the entire audio frequency range, continuously and independently. These param-

## SPEAKERS

# 1979

JBL's L150 floor-standing loudspeaker incorporates a newly developed 12-inch woofer, a 12-inch passive radiator, a 5-inch midrange and a 1-inch tweeter. \$595 each. Circle No. 73.

The highlight of JVC's new Zero-5 speaker is its ribbon tweeter. Also incorporated in the Zero 5's design are a 12-inch freed-edge woofer and a 4-inch midrange driver. \$400 each. No. 74.



KLH 3 speakers include a computer that "reads" the amp output and controls cone excursion to maximize bass response and prevent mechanical overload. \$420, the system. No. 130.

B.I.C.'s new TPR 400 incorporates a device called the total power radiator, designed to create omni-directional, phase-coherent sound. \$270 each. Circle Reader Service Number 65.

eters are: frequency, bandwidth, and sound level. This is achieved through a servo-control circuit that eliminates the need for a separate graphic equalizer. (Simultaneously, Yamaha introduced its first moving coil cartridge—the MC, available as MC-IX mounted in a head shell at \$250, and unmounted as MC-1S at \$200.)

**Turntables.** The two most obvious directions being taken by turntable manufacturers is front controls and straight tone arms in their latest offerings. In both instances such products were developed to please music lovers/audio buffs. The front controls are for easier operation; the straight tonearms for lower mass.

Perhaps the largest line of straight-arm turntables is Dual's—consisting of nine models whose arms are designated ULM (for Ultra Low Mass). When mounted with a matching series of ULM cartridges developed for Dual by Ortofon, the arms have a total effective mass of just eight grams—less than half the effective mass of typical tonearm/cartridge pairings.

BSR was among a handful of companies aiming turntables specifically at "entry-level" hi-fi shoppers who want quality and convenience at a budget price. BSR debuted the 205SX belt-drive automatic with ADC magnetic cartridge at \$80; Akai introduced its AP-B10C, a belt-drive manual complete with magnetic cartridge at \$100; and Sansui bowed the SR-200S, a single-play belt-drive semi-automatic at \$135, less cartridge.

Sansui also debuted three turntables featuring its patent-pending DOB (Dyna-Optimum Balance) tonearm balancing system. A DOB tonearm is pivoted at the optimum point, to minimize vibration transfer and to maximize stylus freedom, the company explains. The new models range from \$230 to \$500.

To some audio enthusiasts, the supreme form of turntable is the straight-line tracking type, generally conceded to have been pioneered in modern form by Rabco/Harman Kardon. Two such models appeared at the Show. Both feature direct-drive motors and

quartz-locked speed control. Aiwa's Model LP-3000U, priced at \$1,200, features a digital speed indicator and pre-programming capability to play selections on a record in a desired sequence.

Phase Linear's Model 8000 Series Two, priced at \$750, is notable in that it features a linear motor to drive the tonearm directly, instead of a traditional worm-gear arrangement. It offers fully automatic or manual operation, and automatic repeat. It is the company's first turntable.

Technics debuted a deluxe quartz synthesizer direct-drive turntable in response to requests from "pro" users for a high quality turntable with 78 rpm speed, in addition to 33 and 45 rpm. The tonearmless SP-15, at \$600, fills that need. It features a  $\pm 9.9$  per cent pitch control for each of the three speeds. The pitch variations are shown on a bright digital display.

Rotel, protesting what it calls an "industrial look" in today's turntables, came out with a series of four new  
(Continued on page 77)

# Two Good.



## Mitsubishi Car Audio.

Two Good from Mitsubishi Car Audio. In-dash units that reflect the technical capability of a company well-defined in the audio industry. Mitsubishi couples disciplined design with practical function.

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Circle No. 24 On Reader Service Card

When car stereo became a hot selling item, many audiophiles—myself included—raised a jaundiced eyebrow. Our thoughts ran along these lines: Car acoustics have never been anything short of rotten; decent-sounding speakers will never fit; miniature-size equipment will never be able to supply adequate power, and where would you get the power anyway when you're limited to a 12-volt battery?

While car acoustics haven't improved—you'll have to talk to Detroit about that one—now there *are* good-sounding miniature speakers and electronics which provide enough power to drive them. Some auto equipment sports 100-watt ratings thanks to advanced DC-to-DC converters and bridged amplifiers. The converters get that 12 volts up to a usable level, and the amplifiers take best advantage of it. And automotive "head ends" (as the signal-source equipment has come to be called) are really getting to be quite good.

Since phono gear is essentially out of the picture on America's pot-holed highways, freeing yourself from the vagaries of FM transmission comes down to using a tape deck. In quality automobile systems, that means a cassette deck; eight-track is definitely for the non-audiophile Detroit. Of course, you can buy pre-recorded cassettes to play on your rig, but you can save a bundle *and* get better auto sound by recording your own. Even more so than with home reproduction—where pundits have panned the quality of commercially-recorded cassettes—you can glean several advantages by tailoring your cassette recordings specifically for auto acoustics.

**Great Home Recordings Fall Flat.** First of all, resign yourself to the fact that car acoustics are pretty crummy. Recording a cassette that sounds great at home does not assure you that it'll sound great on the road. In fact, the opposite is likely to be true. A good wide-range cassette that's a joy to hear on your home rig is almost guaranteed to be a wipe-out in your car. You'll

have to be willing to forgo some of your purist attitudes to make a good car cassette.

**The Problem of Noise.** The real hurdle to overcome is the high level of background noise in an automobile—road noise, if you will. (We assume you want to listen while tooling along.) At highway speeds, the noise level in your chariot is likely to be somewhere around 70-dB SPL on an A-weighted basis. That's assuming you're driving an American compact. Luxury cars might be a bit quieter, subcompacts definitely noisier. At slower speeds, the noise level is likely to be less—perhaps around 62 dBA on a smooth road. Compared with your home listening room—say 30 to 40 dBA—that's still pretty noisy.

The point of the matter is that the background noise constitutes a "floor." Music levels that drop appreciably below the floor get swallowed up and can't be heard. (This is a bit of an oversimplification, but it'll do for now.) Your ear adapts to the background noise by reducing its sensitivity. After a few minutes of driving in a 70-dB-SPL ambience, you adjust, and you're not aware that the surroundings are as noisy as they are—that is, until you can't hear the quiet passages in the music, and you find you have to raise your voice to be heard.

If you were to turn up the volume so that you could hear the quiet sections, the loud passages would be (literally) deafening. The dynamic range of a symphonic orchestra can be upwards of 100 dB. Add that to the 70-dB floor, and you get a 170-dB sound-pressure level—patently ridiculous (roughly the same as the sound-pressure level at the exhaust of a turbojet engine).

Well, you're not about to get a 100-dB dynamic range out of a cassette anyway, so you needn't worry about having the inside of your car sound like a jet engine. But you can get a 60 to 65-dB range, and, on a home recording, that's what you shoot for—the most

dynamic range you can get. That's precisely what you *don't* want in a car! Let's see why.

Assume you start off with a 70-dB-SPL floor and adjust the volume of your rig so the quiet passages just pop through the road noise and can be heard. With 60 to 65 dB of music dynamics, the loud passages would be up around 130 to 135-dB SPL if your amplifier and speakers had the guts to pump out that much sound. It's very unlikely they will, even with a 100-watt-plus power amp and speakers in every nook and cranny. And, if your rig did pump up the sound level in your chariot to 130 dB, what would happen? One, within a relatively short time, you'd suffer a permanent hearing loss, if, two, you didn't total your car first. (At this sound-pressure level, you'd be totally oblivious to the freight train barreling down the track.)

**Aim for Limited Dynamic Range.** By now, you're probably getting the picture, and wide dynamic range in an auto-sound system ain't part of it. A cassette specifically recorded to sound good in a car will have a relatively limited dynamic range—say 30 to at most, 40 dB. You'll then be able to hear the soft passages *and* the loud passages, although, of course, they won't be so different in level as they are in reality. In the car, that'll be a lot less annoying than having the sound regularly drop into the morass of road noise only to pop out with ear-shattering volume.

Dynamic-range limiting is accomplished with a piece of equipment called a "compressor." A "linear compressor" is one that works over the entire dynamic range producing, for example, a 2-dB increase in output for every 3-dB increase in input. In this case, the compression ratio is 3:2 or 1.5, and the 60-dB range of our source is squeezed down to 40 dB—just about right.

While the compressor could be used after the tape player, it's more sensible to compress *prior to* recording. That

Customize your recordings for playback in the car

# TRAVELING TAPE TRICKS

by W. S. Gordon

# TAPE TRICKS

way you end up with less tape noise and tape distortion. Perhaps the leading source of audiophile compressors is dbx, although they're also available from MXR and others. Some models have a fixed compression ratio; on others, it's adjustable. Don't go overboard with the compression; a ratio of 1.5 or, at most, 2, is enough.

Usually, in audiophile equipment, the compressor is paired with a complementary expander—the combination being called a “componder.” The compander is really designed as a noise-reduction system. The source material is compressed prior to recording to fit within the relatively limited dynamic range of the tape and then, normally, is expanded on playback to restore the dynamics and reduce tape hiss. If you compress your recordings and play them back in the car *without* expansion, you've accomplished just what we've been looking for—limited dynamic range. Tape noise won't be reduced of course, but you needn't worry about that since it'll be lost in the road noise. And you've got the best of both worlds. When you listen to that same tape at home, *use* the expander, and the dynamics will be restored and the tape hiss reduced.

**Other Tricks.** Is there anything you can do to improve the sound of your automobile cassettes short of springing for another piece of equipment? Very likely, yes. One trick is to record your auto cassette using Dolby encoding (it's on virtually every home deck) and to play it in the car *without* Dolby decoding. In essence, the Dolby noise-reduction system also compresses the signal before recording and expands it on playback. So, by recording *with* Dolby and playing back *without*, you've accomplished some reduction in dynamic range.

The difference between Dolby and dbx is that the latter operates on *all* frequencies and in a “linear” manner. Throughout the dynamic range, every 3-dB change in input is squeezed into a 2-dB change in output. Dolby B functions *only* in the treble region—roughly above 500 Hz—and *only* on relatively low-level signals, say, those 20 dB or more below standard level. Nonetheless, recording a cassette with Dolby and playing it in the car *without* the Dolby is usually a darn sight better than play-

ing a “straight” cassette or using Dolby decoding (if it's available on your auto rig) on a Dolbyized cassette. Remember, you don't need to quiet the tape hiss; it'll be buried in the road noise anyway.

The reason the Dolby ploy is as effective as it is in a car is due to the “masking” phenomenon. A signal is “masked” (lost) in noise most readily when the noise is of a similar frequency to that of the signal. Thus, a low-frequency signal will stand out in (not be masked by) high-frequency noise, and a high-frequency signal can be heard even in the presence of stronger low-frequency noise. To the extent that our ears are most sensitive in the 2-kHz to 5-kHz region, and to the extent that much of the road noise is composed of high-frequency components, the added boost that the Dolby gives to the low-level treble helps it stand out and be heard in the presence of road noise.

The fact that added high-frequency boost often helps mask road noise has led many car-addicted music fans to experiment with different methods of boosting the high end prior to recording or during playback. Even laying aside the road-noise problem for a second, the frequently poor mounting arrangements of car speakers makes a dollop of treble pre-emphasis helpful. When a speaker is mounted in a wheel well, in the door trim, or tucked away behind the rear seat, the treble has a pretty tough time getting out and to your ears. It's best if the speaker—at least the tweeter—is placed where the sound doesn't get muffled.

**Equalization Games.** Some audiophiles make their auto recordings on chrome or ferrichrome tape and then play them in the car with “normal” (120-microsecond) equalization. This mismatch in equalization results in about a 4.6-dB increase in treble. Again, the tape hiss is greater, but who cares? Some decks seem to record a brighter tape on ferrichrome than on chrome, which has made this the tape of choice for some users.

So far, nothing we've suggested makes your car tapes incompatible with high-quality home playback. Everything we've done for the car—compression, Dolby encoding, use of chrome or ferrichrome tape—can be un-

done by the home system via expansion, Dolby decoding, and the proper playback equalization. The only difference between auto playback and home playback is that, in the car, we will *not* undo the signal processing we have used in making the tape.

**Yet Another Suggestion.** Our final tidbit is more easily done than undone. We're speaking of purposeful equalization. Some recordists use an equalizer in the recording chain to boost the mid and high frequencies prior to making their tape. Then it can be played back in the car, without need for an auto-equalizer system, and still preserve the increased treble. The technique can be effective, but it does earmark the recording specifically for use in the car. Furthermore, adding more high-frequency boost on recording can run up the distortion. For both reasons, we're not particularly enamored of this technique, but we include it for the sake of completeness. There's certainly no harm in trying a little pre-equalization. You'll have to experiment to find what you like best.

We do urge you to select cassettes that have good mechanical innards. In the winter, cars are cold; in the summer, they're broiling hot. Neither extreme is conducive to getting the best performance from the cassette. And, too, cassettes are more likely to jam in the car than in your home rig. So, the car is no place for an El Cheapo cassette.

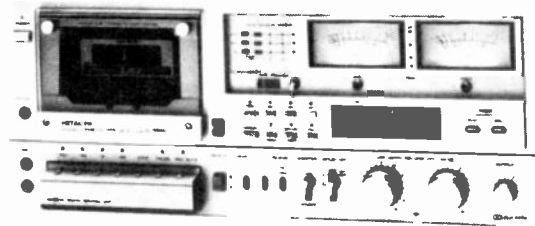
**In Summary.** Go back over this article, and what have we said? Compress the dynamic range of the recording—but don't expand it. Or use Dolby encoding—but don't decode. (I don't advise using *both* Dolby and dbx.) Use chrome or ferrichrome tape with the proper record equalization—but play it back using ferric (NORMAL) equalization. Don't worry about the tape hiss. Every one of these suggestions for making a car tape recording is a no-no when it comes to home-music reproduction. Every suggestion raises the purist's hackles.

I'm not suggesting that these are the ways to get technical perfection, and if we're to define “high fidelity” as the flattest frequency response, the lowest noise, and the greatest possible dynamic range, my recommendations fall flat on their posteriors. But, if we define high fidelity as getting the best possible sound reproduction under a given set of circumstances, I submit that my suggestions have merit for making car cassette tapes. When you're dealing with the miserable acoustic conditions of an automobile, it's time to put measurement data aside and go for a tricky end run. ▲

# SPOTLIGHT ON...

## HITACHI D-5500 CASSETTE DECK

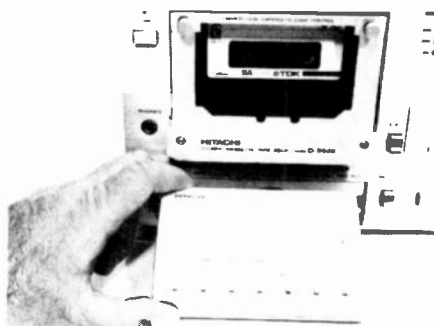
Circle No. 72  
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### THE PRECISION OF THE MICROPROCESSORS IS ABSOLUTELY ASTOUNDING

Pick a tape, *any* tape—just as long as it's a standard hi-fi brand, and not some 3-for-\$1 junk. Insert it in the Hitachi D-5500 cassette deck, press the *record* button and press a button labeled TEST. Now step back and watch the small LED panel lamps wink, blink and flicker. In a few moments the tape will stop, rewind to where it started from, and the machine will be ready for recording with the machine optimally adjusted to match the tape's requirements for bias, frequency equalization, and level sensitivity for optimum Dolby tracking.

It doesn't matter what tape you choose to use. The full range of tapes

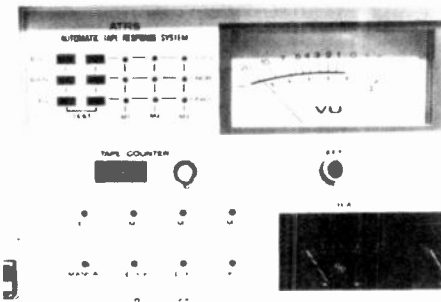


The remote control module contains all tape functions, including a record mute that disables the input signal while the tape is still driving. When the module is pushed into the D-5500's front panel, it becomes an integral part of the deck and draws its power from the deck rather than from its four AA-type battery power.

from inexpensive ferric types such as TDK-D to the Ferrichrome-bias types to the high bias types such as TDK-SA and Maxell UD/XL Type II, is anticipated by the computerized test system within the Hitachi D-5500. This remarkable machine will pre-adjust bias, equalization, and sensitivity for optimum results.

The Hitachi D-5500 is a three-head system machine (simultaneous record/playback) that features two built-in microprocessors, which are actually miniature computers.

One microprocessor is used for a remote control system that works on an infra-red light beam. What appears to be a routine set of tape drive controls is actually built into a hand-sized cabinet that pops out of the front panel at the touch of a button. When the remote is ejected, the power source for its invisible infra-red light beam control signals is switched from the deck itself to internal batteries. Each time you press a control button, a coded light beam is transmitted to the deck. A computer checks for proper



The D-5500's microprocessor tape alignment system (ATRS) includes an LED matrix which allows you to monitor the progress of the tests and the type of tape entered into the direct access memories. Eight buttons below the matrix control the TEST start, the manual mode and manual selection of tape types, as well as the three direct access memories included.

coding sequence, and once confirmed, the machine's tape drive is switched to the selected mode. (All this takes place faster than you can blink.) When the remote control is reinserted into the cabinet it becomes an integral part of the recorder. Nevertheless, the tape drive mode is still determined by the light beam, only now the remote's transmitter is pressed directly against the detector. The only direct connection is the power source from the deck, which supercedes the remote's internal battery. (Continued on page 76)

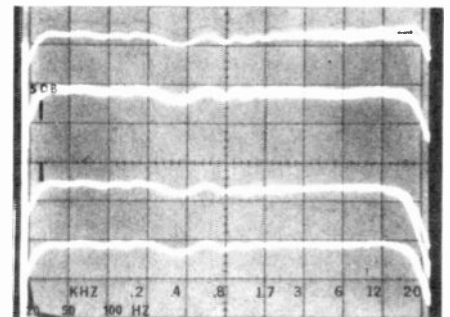


Fig. 1. Top trace is the performance of Maxell UD/XL II, without Dolby. Second from the top: TDK SA, without Dolby. Next: UD/XL II with Dolby. At bottom: SA with Dolby. Details on their significance in text.

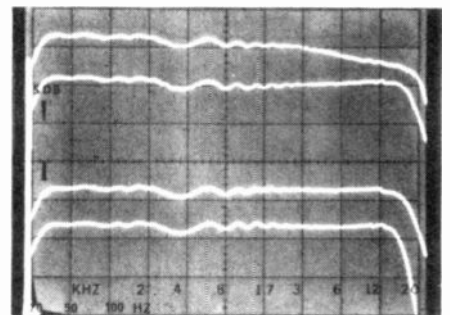


Fig. 2. All traces show Dolby performance. At top: TDK D with a manual selection of normal tape. Below it, the same tape, computer-optimized. Third from the top is the computer optimized performance of a CrO<sub>2</sub> tape, and last is an old ferric tape formulation's optimized performance.





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# Opera

For Today

Tatiana Troyanos

by Speight Jenkins

□ One of the most arresting and slightly troublesome careers of the last decade is that of the American mezzo-soprano Tatiana Troyanos. Up to this point the young singer has followed a standard route for the American who wants to be a superstar. An American of Greek descent and a sexy woman with a striking figure, she studied at the Julliard School, graduating in the early '60s. In 1963 she came to the New York City Opera, making her debut in *A Midsummer Night's Dream*, and later singing *Oedipus Rex*. Two years in that company (which was still performing at the antiquated New York City Center) brought her acclaim among New York's opera cognoscenti but little real recognition, and in 1965, she snapped up a chance to go to Hamburg as a member of Rolf Liebermann's company.

At the time, Hamburg



In Act I of *Tannhaeuser*, Ms. Troyanos captures the dramatic air surrounding the character of Venus.

was generally considered one of the world's most exciting companies in terms of repertory and overall casting. Liebermann's fame as an artistic director would later bring him to the Paris Opéra and cause him to be invited to be chief of the Metropolitan (he turned it down because there are no subsidies in the United States), but at that time he was set to build the Hamburg company to as high a level as possible. In 1967, with Miss Troyanos as one of the principal artists, the Hamburg company came to the first of the Lincoln Center festivals which featured visiting European opera companies and she made quite a sensation as Baba the Turk in Stravinsky's *Rake's Progress*. Her voice then was large and smoky, a mezzo-soprano of weight with a coloratura facility that made it most unusual. She had already taken on, at the Aix-en-Provence festival of the preceding year, one of the roles for which she would be most famous at most major European houses, the Composer in *Ariadne auf Naxos*. It took her until the mid-70s to win recognition at home—a condition all too frequent—but success, when it came, happened all over the country. Charlotte in *Werther* opened the doors of Chicago, Dido in Purcell's *Dido and Aeneas*, took place in 1975 in Dallas. Poppea in Monteverdi's opera served as her San Francisco debut that year, and the next spring (1976) she came to the



Tatiana Troyanos portrays the Composer, one of the roles which gained her fame throughout Europe.

Metropolitan as Octavian in *Der Rosenkavalier* and the *Ariadne* Composer. So far so good. Most of the records up to then—and chronology is a little skimpier with recordings—had been intelligent, centering on Mozart. But after the success that first spring in New York, she began to go into repertory for which she was not nearly so well suited. She decided that the dramatic parts of Verdi were hers, and she sang Anneris in *Aida* at the Met. She also pursued Santuzza in *Caratteria Rusticana* and Dalila in *Samson et Dalila*. The problem at least in my opinion is that her lustrous, expressive voice is neither weighty enough nor of the proper bril-

liance for the dramatic mezzo-soprano repertory. When she does sing dramatic roles well, it is German opera that is ideal for the singer, both because her training tends to lead her to typically German production and because she seems to feel most at home in that language. Miss Troyanos additionally is moving as fast as possible into bel canto, too. In May in New York she sang Romeo in a concert performance of Bellini's *Capuleti ed i Montecchi*, and she is making something of a specialty of Adalgisa in *Norma*, which she will soon record. Here the problem lies precisely in her manner of singing. If the production is not forward as hers is not, if the voice is not crystal clear with the Italian words pronounced distinctly, bel canto is not right. The same can be said for Mozart, but her best recorded Mozart has been  
(Continued on page 78)



At the Met with Judith Blesen (right) as Sophie, Ms. Troyanos made her debut in *Der Rosenkavalier*.

# BEYOND DC

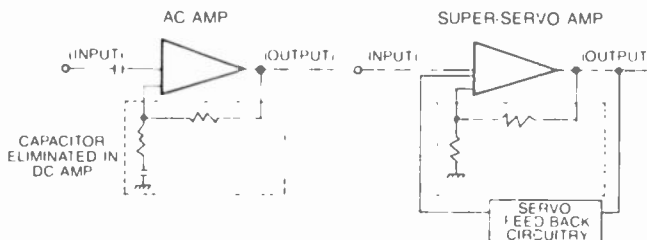


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REVOX  
B790 - DIRECT DRIVE TUR

# SOLVING THE COMPONENT PUZZLE

FRED PETRAS



## A CLOSER LOOK AT YOUR OPTIONS WHEN BUILDING A HIGH-FIDELITY SYSTEM

For first-time buyers, choosing a hi-fi system may seem like a scary, intimidating proposition. All those mumbo-jumbo words and phrases—like selectivity, frequency response, separation, signal-to-noise, capture ratio, power output—what do they *mean*? You're overwhelmed. So you sit tight, denying yourself the pleasure of a hi-fi system. And keep on listening to your compact (or console) with its blah radio reception and mushy sound.

In reality, these terms are fairly easy to understand—in an actual in-store

buying situation, with a good salesman explaining them in the process of demonstrating the equipment to which they apply. You'll also learn that technical terms are only a small part of the total selection/buying process.

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# COMPONENT PUZZLE

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One possible \$600 system includes Sherwood's S-7250 CP receiver (\$250), Pioneer's PL-514 turntable (\$125) and Acoustic Research's AR-25 speakers (\$220 per pair). The S-7250CP has a power output spec of 20 watts per channel with less than 0.2% THD, and includes noise filter, muting, and loudness compensation. The PL-514 turntable is a semi-automatic belt-drive turntable whose features include acoustic-feedback-reducing feet, oil-damped cueing, and an anti-skate mechanism. The AR-25's are two-way speakers that include a 2-position tweeter control, 8-in. woofer and 1¼-in. tweeter.

## \$700 SYSTEM 1



A \$700 system could include JVC's R-S7 receiver (\$300), Sanyo's PLUS Q25 turntable (\$180), and Ohm's E speaker system (\$120 ea.). The RS-7 offers 50 watts per channel with 0.03% THD, signal strength and tuning meters, FM muting and loudness compensation. The PLUS Q25 turntable is a quartz-locked direct-drive unit with front-panel controls for speed select, cueing, and reject functions. Ohm's E speakers utilize 8-inch woofers, 2-inch tweeters, and a three-position treble-contour switch. They measure 21½ by 11½ by 7¼ ins., are designed to be used with amps rated at 7 to 50 watts per channel.

will not be nearly as agonizing as you'd expected. When your "rig" is set up at home and you turn it on to hear first quality sound, you'll have an exquisite sense of self-satisfaction.

**Define Your Needs.** Defining your needs consists of asking what you expect of a hi-fi system. If all you're after is high quality radio reception, a receiver and a pair of speakers will fill the bill. If you're after radio (AM and/or FM) reception and phonograph record playing capability, you'll also need a turntable—either a single-play type or a multi-play type (record changer).

Instead of records, you may prefer tapes. In this case your system would consist of a receiver, cassette (or reel-to-reel) deck, and speakers. This would enable you to capture radio programs on tape for subsequent playback through the receiver (via its amplifier).

You may want to incorporate all three formats of programming—radio, records, tapes. Then the system would be made up of receiver, turntable, tape deck, and speakers.

But if you can't stand disc jockies with their glib chatter and sales pitches, and prefer listening to records and tapes, you could save substantially by substituting an integrated amplifier for a receiver. You could buy a dozen LPs with your savings. Or have a lot more power for a given dollar figure. (And if you change your mind about DJs later, you could enjoy radio broadcasts by buying an inexpensive tuner to hook into the amplifier.)

Defining your needs should include a bit of crystal-balling. Do you expect to stay where you now live, or will you move on, to perhaps a larger home or apartment? If you expect to move to larger quarters within a year or so, consider investing in larger speaker systems than the ones you would buy were you to stay put. Another option would be to buy a hi-fi system with speakers *smaller* than those you would buy were you to stay where you now live. Smaller? Yes . . . in anticipation of using those speakers in a second location in your new residence. You would later buy a large pair for use as the main speakers in your newly-located hi-fi system. (Most receivers and integrated amplifiers offer connections for two pairs of speakers.)

A check of local hi-store advertising will give you some idea of prices of receivers, turntables, tape decks, and speakers. To translate your defined needs into specific models and prices before evaluating the equipment in the store is virtually impossible. For example, you might find the speakers that sound good to you need a lot of am-

plifier driving power. This means you'll need a receiver or amplifier with considerable power—more than you'd anticipated, at a higher price. In determining your budget, try to come up with a *range of figures*—the minimum you'd like to pay, to the top amount you may have to pay to get what you really want.

Since buying hi-fi is a matter of getting what you pay for, you'd be smart to *buy better* rather than to buy cheap. You'll never regret buying better. You'll enjoy the long-term benefits of smoother performance, greater reliability, longer equipment life, along with that indefinable satisfaction of owning something superior.

If you can't buy better at the moment but would like to have better equipment, there are two approaches—holding off until you have the money, or buying piece-meal (via a building block approach). If the system is for you alone, going the latter route could be accomplished by buying a receiver, plus a pair of stereo headphones instead of a pair of speakers. The headphones would give you hi-fi listening pleasure while you waited until you could afford the speakers you really wanted. The other elements of a total system could be bought as your budget permitted.

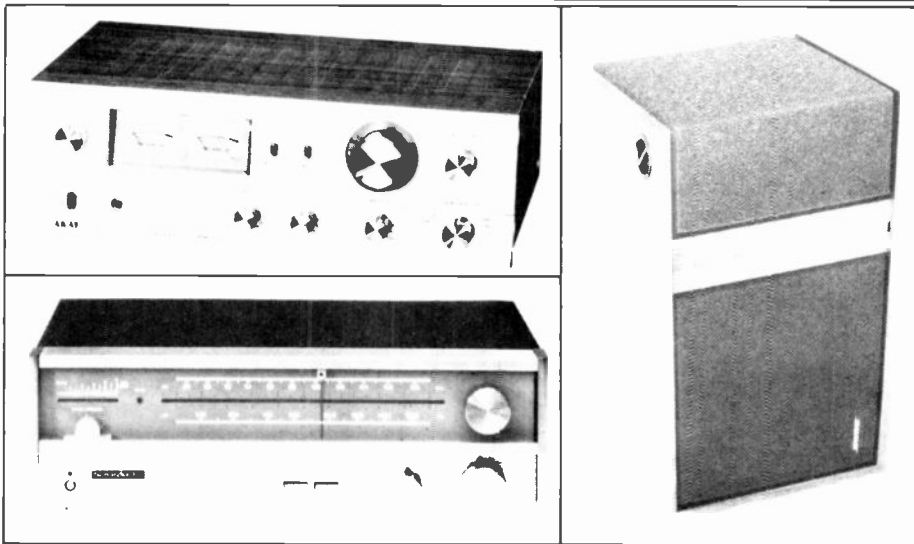
In setting a budget figure—for the short haul or the long haul, consider this: The audio industry estimates that the operating life of the average good quality audio system is about 12 years. Say you have a proposed budget of \$600 for a typical system but discover after extensive listening that you can't find anything for less than \$800 that satisfies your ears. You feel that's too much, and are tempted to refuse to buy and continue to "make do" with what you already have.

Put the matter into perspective: Divide the proposed budget of \$600 by 12 (years). That comes out to \$50 a year. Divide the \$800 you don't want to pay, and it comes out to \$66.66 per year. Are you going to deny yourself the pleasures of first rate sound for a paltry difference of \$16.66 a year? Of course not!

Once you've determined your needs—let's say a receiver, turntable, speakers, at a budget of \$700—you should decide how to apportion your overall budget. According to U.S. Pioneer, the country's largest audio supplier, the apportioning should be along these lines: 45 per cent of the total for the receiver (\$315), 25 per cent for the turntable (\$175), and 30 per cent for the speakers (\$210 the pair).

A major audio directory shows a

## \$700 SYSTEM 2



Another \$700 system might include Akai's AM-2450 integrated amplifier, Harman/Kardon's hk500 tuner, and Bose's 301 speaker system. Turntable and/or tape machine could be added at a later date. The AM-2450 amp (\$225) offers 45 watts per channel, tape dubbing facilities, large power output meters, and loudness compensation. The hk500 tuner (\$230) includes adjustable FM muting, variable output level, 75/25 uSec FM de-emphasis switch, and combined signal strength/tuning indicator meter. 301 speakers (\$220 pr.) handle 10 to 60 watts of output power, include 8-in. woofer and 3-in. tweeter.

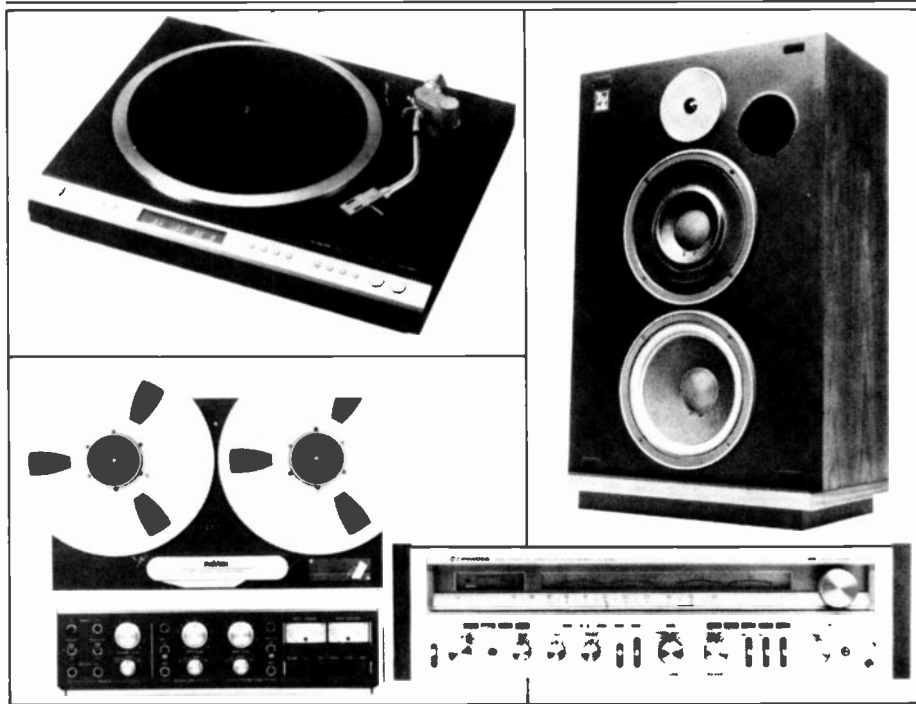
## \$1200 SYSTEM



In the \$1200 range your possibilities include the Sony TA-F40 integrated amp (\$350), Yamaha's YP-D4 turntable (\$230), Celestion's Ditton 15XR speakers (\$380 a pair), and AIWA's AD-M200U cassette deck (\$260). The TA-F40 includes a thermodynamic cooling system, phono preamp for moving coil cartridges, and 50-watts-per-channel output capability. The YP-D4 incorporates a direct-drive system, auto-return feature, and a dynamically balanced S-shaped tonearm. The Ditton 15XR's include a 1-inch tweeter, an 8-inch bass/midrange driver, and an 8-inch auxiliary bass radiator. The AD-M200U offers full auto-stop, fine-tuneable bias for normal tape, and three-position bias/EQ selection.

# COMPONENT PUZZLE

## \$4500 SYSTEM



When the sky's the limit you might choose Kenwood's KR9050 receiver (\$1150), Hitachi's HT-860 turntable, Electro-Voice's Interface: C Series II speakers (\$995 per pair), and the ReVox B77 reel-to-reel machine (\$1499). The KR9050 offers every feature imaginable and 200 watts per channel with .02% THD. The HT-860 offers microprocessor-controlled automatic operation and photoelectric sensors among other features. \$795. Incorporated in the Interface speakers are a 10-inch woofer, a new 6½-inch vented midrange driver, and a "SuperDome" tweeter. Low-frequency equalizer is also included. The 3-motor, 2-speed B77 handles up to 10-in. tape reels and is a top-notch performer.

variety of big-name-brand receivers priced at about \$315. They offer from 30 to 50 watts per channel of power output—enough to drive most speaker systems to satisfying listening levels. The directory shows over a dozen big-name turntables in the \$175 price area, most semi-automatics, all direct-drive types. You can also get direct-drive manual units minus the semi-automatic functions in the Sanyo, Sony and Technics lines for between \$130 and \$150. Many quality belt-drive models are also available at around \$175.

Speaker systems at \$210 a pair are available in some 15 big-name brands, and in several lesser but nationally-distributed speaker lines. Most are bookshelf models that utilize eight-inch woofers and will produce first-rate sound. Three brands—Advent, ESS, JVC, offer models with 10-inch woofers at that price level.

What if your choices vary from the

above formula? It depends on the degree. A difference of plus or minus 15 per cent should not affect your system in a substantially *audible* way. And you may luck out, to find a \$315 receiver on sale for \$275, enabling you to spend \$35 more for the speakers (desirable). A rule of thumb in any audio system purchase is to weight the budget toward the speakers. Remember, the only thing that actually produces audible sound is the speaker.

How would you apportion the budget if you want only a receiver/speakers ensemble? Experts give several recommended ratios—like 60/40, favoring the receiver, to 40/60, favoring the speakers. Let's put that into the framework of a \$600 budget. In the first instance, \$360 would be for the receiver, \$240 for the speakers. Speakers in this league would encompass about an equal number of models with eight-inch or 10-inch woofers, in a fairly broad selection.

You could live comfortably with such a compatible pairing.

Reversing the ratio to \$240 for the receiver and \$360 for the speakers would result in the receiver (ranging from 16 to 25 watts per channel) being on the borderline, with just about the minimum in terms of power reserve for distortion-free reproduction of music with heavy tonal bursts. However, through judicious shopping you might find a pair of high quality, highly efficient bookshelf or floor model speakers with 10 or 12-inch woofers that could be easily driven by the lower-powered receivers.

(If you were operating with an \$800 to \$1,000 budget, your shopping would be a lot easier, your choice broader in both receivers and speakers.)

As noted earlier, you might prefer a system with integrated amplifier instead of receiver, turntable, and speakers. In which case you could apportion a \$700 budget as if buying a receiver-oriented system, and end up with more power output (50 to 70 watts per channel); or settle on the 30 to 50 wpc range of power and pocket the difference—to invest in records, or to buy better speakers.

At this point you are ready for a foray into the Retail Audio World. Your objectives should be to listen to as much equipment as possible (without antagonizing dealers and/or their salesmen), to pick up as much literature describing audio equipment as possible, getting as much price information as you can, or at least getting prices on equipment that appeals to you and may figure in your final choice, and determining which store(s) you want to deal with (via sizing up the depth of their equipment selections, the apparent knowledge of their salesmen, their service and warranty policies, and their over-all attitudes toward consumers.

Relative to selecting stores, check relatives and friends who have bought systems within the past year, and also phone the local Chamber of Commerce or Better Business Bureau office to get whatever information they are willing to give on local audio merchants. A basic bit of advice about stores: Since audio components are a specialty product category, your best bet would be to deal with an audio specialist store.

Once you've done your "homework" in the stores and have amassed a batch of literature, and feel you've gone as far as you can in getting a fix on what buying a system is about, start making comparisons where comparisons are possible via the literature.

(Continued on page 79)



# SOUND PROBE SOUND PROBE SOUND PROBE

What we present in this series are explanations of a particular speaker's design principles combined with subjective listening evaluations. Together these two critical considerations may give the reader a useful notion of the speaker's character.

What the poet Robert Burns said about the best-laid plans of mice and men seems to apply especially to loudspeakers. Even a speaker designed with the greatest engineering finesse and the most impressive specs may sometimes turn out a lemon. It probably wouldn't sound all that bad. It just wouldn't sound quite right. That's why the ear must remain the ultimate judge.

by H. S. FLETCHER and CHRISTOPHER GREENLEAF

## Avid 110



Circle No. 121 On Reader Service Card

### Description:

One way to design a loudspeaker is to try nothing new. There are plenty of proven principles lying around, just waiting to be used properly with a fine sense for what music really sounds like. And that's just what Avid has done in putting together its Model 110—a solid, safely conventional piece of equipment giving excellent value for its \$135 price.

The outward dimensions of 21½ x 12¾ x 9½ inches make it a medium-sized bookshelf speaker, attractively finished in a vinyl-like substance which manages to look convincingly like a dark hardwood. The front panel is also finished in this way so that the speaker can be played with the brown grille removed.

A striking design feature is the proximity of the 8-inch woofer and the 1-inch soft-dome tweeter. Having the two drivers of the system so close together creates the impression that all the

sound originates at a single point. This makes for excellent stereo imaging, allowing listeners to accurately pinpoint the apparent location of every instrument. Yet because the tweeter scatters the highs over a broad angle, there is no unpleasant beaming of the treble. On the contrary; the Avid 110 is one of the most open and spacious sounding among front-radiating speakers. Only multi-directional speakers—which may not be to everyone's taste, though we happen to like them—create a broader sound dispersion.

The Avid 110 is unusual in having no tweeter level control. The designers evidently believe that balancing adjustments between lows and highs should be made with the amplifier tone controls and not at the loudspeaker. This means that you have to compensate for room acoustics with the treble control and may have to set that control off-center to get an acoustically flat response.

## RTR 300D



Circle No. 125 On Reader Service Card

### Description:

This is a handsome, floor-standing column speaker measuring 14½ inches in width, 12½ inches in depth, and 42 inches in height, finished in black fabric with a grained walnut veneer top and base. It thus occupies remarkably little floor space for a powerful speaker employing two 10-inch woofers, a 1½-inch soft-dome midrange driver, and a 1-inch soft-dome tweeter. The two woofers—each equipped with a hefty four-pound Alnico V magnet—work into a sealed enclosure, producing the tightly controlled bass that is characteristic of such designs. The crossover frequencies in this 3-way system are located at 1250 and 10,000 Hz.

RTR takes particular pride in the newly developed soft-dome midrange unit, which is the key to the considerable power-handling capacity of this model: at least 150 watts RMS which is enough to loosen the plaster and bring out the neighbors. According to

RTR's engineers, soft-dome construction is preferable because of the smoothness of its frequency response. But it has a drawback. When pushed by high wattage, soft domes become prone to distortion, losing the very virtues that distinguish them at lower power levels. Consequently, such speakers used to be limited in their power capacity.

To overcome this deficiency and combine the smoothness of soft-dome response with the power capacity required for extreme loudness levels, RTR developed new techniques of coil winding and bonding the coil to the diaphragm. As a result, the midrange unit of this speaker accepts more than 40 watts of long-term continuous power over its entire frequency bandwidth from 900 to 10,000 Hz and can even handle short 100-watt peaks with negligible distortion. Under normal operating conditions, the midrange portion of the total input would not even

# SOUND PROBE SOUND PROBE SOUND PROBE

## Avid 110



Circle No. 121 On Reader Service Card

The exceptional openness of the sound—free from any restrictive “boxiness”—also derives from the construction of the woofer (patent pending) which brings the cone so far forward as to minimize diffraction from the cabinet. It is as if the woofer cone were out there vibrating in open space rather than being stuck in a box.

The woofer itself is one of the long-throw, high-compliance types. This means that the cone can swing back and forth over a distance great enough to move plenty of air with each stroke and generate sufficient bass despite its relatively small size. The woofer magnet is strong enough to permit it to deal with fairly high power levels. It will handle up to 100 watts of musical program material. (Its power handling ability in watts RMS is not specified.) To enable the tweeter to match such power levels, its voice coil is bathed in ferrofluid, a magnetic liquid filling the voice coil gap. The liquid provides efficient heat conduction away from the coil, preventing overheating and resultant deformation during high-volume peaks.

The enclosure is a sealed box, employing the acoustic suspension principle. As usual, this yields a tight, well-controlled bass and a clear midrange. Since back radiation from the woofer

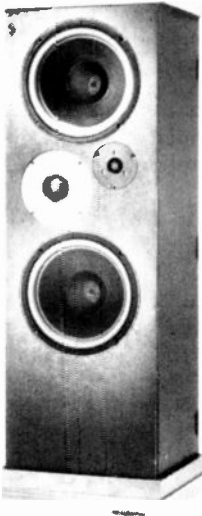
cone is trapped and absorbed inside the box, it also entails some sacrifice of efficiency. Even so, this speaker puts out a fairly generous 88 dB sound pressure level at the 1-watt measurement standard, so you can be sure it's no power hog needlessly guzzling watts. An amplifier or receiver with as little as 15 watts per channel should be able to drive the Avid 110 quite comfortably.

### Performance:

We can honestly say that nothing in the sound of this speaker hampered our musical pleasure. Frankly, that's a surprise. In this price range (and, alas, even in more expensive models) one often encounters shrillness at the top and blurry thumps at the bottom. All these remained happily absent. The highs, in particular, combined sweetness and clarity in a way that made all kinds of musical sounds seem pleasantly natural: violins as well as trumpets, voices as well as piano. The latter also attested to the speaker's crisp transient response, which we confirmed by playing some percussion music. The impact of these sounds is sharp without being harsh. We have already commented on the delightful openness of the sound, but we were so impressed with it that

*(Continued on page 74)*

## RTR 300D



Circle No. 125 On Reader Service Card

approach these levels, the 3.16-pound magnet of the midrange unit, acting upon moving parts with very low mass (a mere gram), assures swift and accurate response to transients.

As a company producing its own drivers, RTR was able to modify the woofers so as to blend optimally with the new midrange unit, making the overall sound spectrum notably “coherent”—that is, without discontinuities in the crossover region, where the ear is most sensitive to subtleties of phase shift and similar sonic detail. The cone materials themselves were selected to provide high internal damping of spurious modes of vibration. This suppresses diaphragm resonances and at the same time assures sufficient rigidity to prevent cone “breakup” in the higher frequency range of the woofer and thus contributes to the end-effect of overall sonic coherence.

The tweeter is also of the soft-dome type, complementing the basic character of the midrange driver. Again a special design effort has been made to enable this type of tweeter to accommodate high power levels. Both tweeter and midrange levels can be separately controlled by continuous potentiometer adjustments at the rear to tailor the speaker to its acoustic environment.

The 300D has a nominal impedance of 4 ohms, which differs in one important respect from the more commonly used 8-ohm impedance. It lets the speaker draw more power from the amplifier, which accounts for the fact that the RTR 300D develops fairly high loudness levels at moderate settings of the volume control. This, it should be noted, does not mean higher efficiency—i.e., more sound per watt. It merely means that more watts flow to the speaker at lower volume settings. A minimum amplifier power of 25 watts per channel is suggested to drive these speakers, and higher wattage would be preferable if their possibilities are to be fully realized.

Frequency response is 36 to 20,000 Hz within 2 dB, and usable overall response extends from 28 Hz to 25,000 Hz, easily reaching down to the lowest depths. Price is approximately \$399 each.

### Performance:

With our curiosity piqued by all these claims to technical innovation, we decided to torture the RTR with just about every kind of sound texture to be found in our record collection. We played Mahler Symphonies with huge, slowly mounting crescendos. We

*(Continued on page 74)*

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136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

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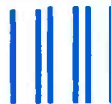
loudspeaker system.

What brand? \_\_\_\_\_ Model? \_\_\_\_\_ Price? \_\_\_\_\_

If you were to replace it today, what would you buy?

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121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

Do you currently have an auto high-fidelity  
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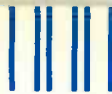
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What receiver or tuner do you currently own?

Receiver  160  Tuner  161  Brand \_\_\_\_\_ Model \_\_\_\_\_

If you were to replace it today, what would you buy?

Receiver  162  Tuner  163  Brand \_\_\_\_\_ Model \_\_\_\_\_

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# hi-fi/stereo

## BUYERS' GUIDE

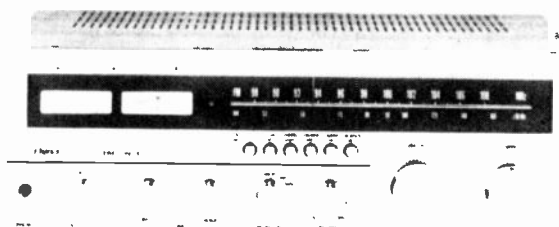
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# TEST REPORTS

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## RECEIVERS



Circle No. 133 On Reader Service Card

### LAFAYETTE CRITERION MARK V AM/FM RECEIVER

Second from the top of Lafayette's Criterion line of receivers, this unit offers 44 watts of output power per channel plus a handful of conveniences. Included are two tape monitors, an FM mute, meters for both center-of-channel tuning and signal strength. \$320, including wood-grain-look metal cabinet.

**DESCRIPTION:** An AM/FM stereo receiver FTC-rated at 44 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion no higher than 0.3% THD at any frequency.

Features include: a stereo beacon; FM center channel and AM/FM signal strength tuning meters; automatic dubbing from one tape to another; and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are inputs for magnetic phono, aux, and two tape. Outputs for two speaker systems, two tape, and phones.

Controls are provided for tuning, volume, balance, ganged bass, ganged treble, input/mpx filter selection, and power/speaker selection. There are switches for high filter, loudness compensation, stereo/mono tape monitor A dub, tape monitor B, and FM muting.

The FM antenna input is 75 $\Omega$ /300 ohms. A rod antenna and external connection are provided for AM. Switched and unswitched AC outlets are provided.

Overall dimensions are 17 $\frac{3}{4}$  in. wide x 5 $\frac{3}{4}$  in. high x 13 $\frac{1}{4}$  in. deep. Weight is 22 lbs.

**PERFORMANCE—FM TUNER:** For 300 ohm and "tee" antennas full limiting was attained with 4  $\mu$ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 11  $\mu$ V. The stereo high fidelity sensitivity (55 dB quieting) was 85  $\mu$ V. The mute release fades out over the range of 2 to 5  $\mu$ V; it does not "snap" in and out as is common for the majority of tuners.

At standard test level, the stereo frequency response for the rated range of 30 to 15,000 Hz was +1/−0.7 dB (down 1.5 dB at 20 Hz). Monophonic distortion measured 0.1% THD. Stereo distortion was 0.2% THD. The signal-to-noise ratio measured 72 dB. Stereo separation was 40– dB. Selectivity was good.

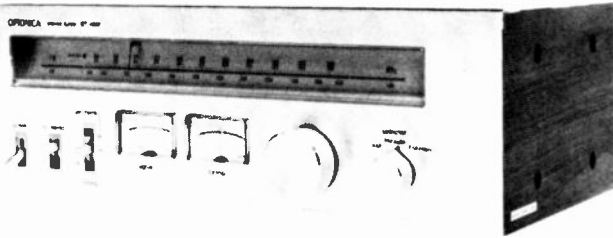
**PERFORMANCE—AM TUNER:** Average.

**PERFORMANCE—AMPLIFIER:** The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 43 watts RMS. The frequency response at 43 watts/8 ohms measured +0 −0.1 dB from 20 to 20,000 Hz at a distortion no higher than 0.14% THD at any frequency.

The tone control range measured  $\pm$ 13 dB at 50 Hz; +11/−10 dB at 10,000 Hz.

The magnetic input hum and noise measured 66 dB; stereo separation was 59 dB. ▲

## TEST REPORTS / TUNERS



Circle No. 81 On Reader Service Card

### OPTONICA ST-4205 AM/FM TUNER

Its features include an Air Check (400 Hz) output as an aid to those who will be recording FM broadcasts. It performs admirably and measures up to our expectations of a tuner in its price category: \$200 in metal cabinet with wood trim.

**DESCRIPTION:** An AM/FM stereo tuner featuring a stereo beacon, FM center channel and AM/FM signal strength tuning meters, a variable line level output, and a 400 Hz "Air Check" output for calibration of associated recorder(s).

One set of variable line level outputs is provided.

There are controls for tuning, and AM/FM selection. Switches for power, hi-blend (mpx noise filter), and FM mute/Air Check. The output level adjustment is on the rear apron.

The FM antenna input is 75/300 ohms. An internal antenna and external antenna connection are provided for AM. One unswitched AC outlet is provided.

Overall dimensions are 17-7/16 in. wide x 5-11/16 in. high x 10-13/16 in. deep. Weight is 12.1 lbs.

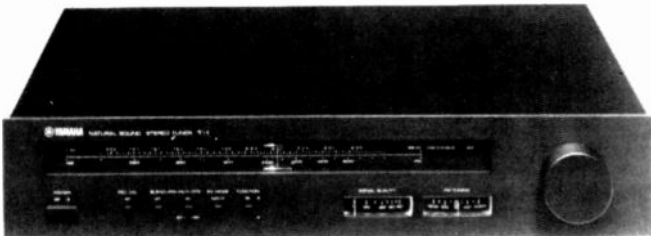
**PERFORMANCE—FM TUNER:** For 300 ohm and tee antennas: Full limiting was attained with 3  $\mu$ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 7.5  $\mu$ V. The stereo high fidelity sensitivity (55 dB quieting) was 60  $\mu$ V. The mute release faded out over a range of 1.8 to 3  $\mu$ V.

At standard test level the stereo frequency response measured  $\pm 1/-1.5$  dB from 20 to 15,000 Hz. The monophonic distortion measured 0.27% THD. The stereo distortion was 0.55% THD. The signal-to-noise ratio measured 72 dB. Stereo separation was 40 dB. Selectivity was good.

The maximum output level corresponding to 100% modulation the transmitter measured 860 mV.

The Air Check output level was equal to 55% stereo modulation, 65% mono modulation. Adjusting the record level so the Air Check is approximately  $-2.5$  dB will provide a satisfactory "compromise" reference recording value.

**PERFORMANCE: AM TUNER:** Average. ▲



Circle No. 101 On Reader Service Card

### YAMAHA T-1 AM/FM TUNER

A tuner which is simply outstanding in terms of minimal distortion and selectivity/sensitivity performance. Convenience features are plentiful and the most severe criticism of the testing laboratory is that the owner's manual could use some revision. \$365, in metal cabinet.

**DESCRIPTION:** An AM/FM stereo tuner featuring: a stereo beacon; automatic wide and narrow selectivity selection depending on the strength of the received signal and/or interference from signals on nearby channels; automatic use of FM antenna (indoor or outdoor) as an external AM antenna; an FM center channel tuning meter; an AM/FM signal strength meter that also serves as a "signal quality" indicator and a

multipath indicator (combined with the FM muting off function); a record level check that provides a 333 Hz output tone equal to 50% modulation of an FM signal; and fixed and variable line level outputs.

Controls are provided for tuning and output level. There are switches for power, record calibrate output tone, blend (mpx noise filter), FM mute on/off-with signal meter used as multipath indicator, local/distance reception (FM IF selectivity control and AM input attenuator), and AM/FM selection.

The FM antenna input is 75/300 ohms. The AM section uses the FM antenna as the AM antenna, there is also a connection for an AM antenna.

Overall dimensions are 17 $\frac{1}{8}$  in. wide x 3-1/16 in. high x 14-3/16 in. deep. Weight is 12.6 lbs.

**PERFORMANCE—FM TUNER:** For 300 ohm and tee antennas, full limiting was attained with 3.5  $\mu$ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 8.5  $\mu$ V. The stereo high fidelity sensitivity (55 dB quieting) was 60  $\mu$ V. Full mute release was attained with 10  $\mu$ V.

At standard test level, the stereo frequency response measured  $\pm 0.5$  dB from 20 to 15,000 Hz. Distortion—in the wide selectivity (local) mode—measured 0.09% THD monophonic; 0.07% THD stereo. The signal-to-noise ratio measured 83 dB. Stereo separation was 40+ dB.

The distortion cannot be easily tested in the high selectivity (distant) mode because the tuner automatically switches to the LOCAL/wide-band mode at "standard test level." In our unit, the LOCAL/DX pivotal input signal level was 30  $\mu$ V. If the signal strength was less

## TEST REPORTS/PREAMPLIFIERS

than 30  $\mu$ V the tuner switched to the DX mode. If the signal input was slightly greater than 30  $\mu$ V, the tuner switched to the local mode. At 30  $\mu$ V, in the DX mode, distortion plus noise measured 1% THD+N; in the local mode distortion plus noise measured 0.22% THD+N. The system works extremely well and "makes a difference you can hear" when tuning from weak to strong stations.

In terms of selectivity: in the local mode it's good; in the stereo mode it's notably excellent.

The fixed output level, and the maximum variable output level measured 860 mV at 100% modulation of the FM transmitter.

The record output check level was within 0.5 dB of 50% modulation of a mono FM station, and 1.8 dB higher than the 50% modulation level of a stereo FM channel (the Dolby reference level). Adjust your recorder(s) accordingly.

Overall sound quality as judged by our listening panel was "superb."

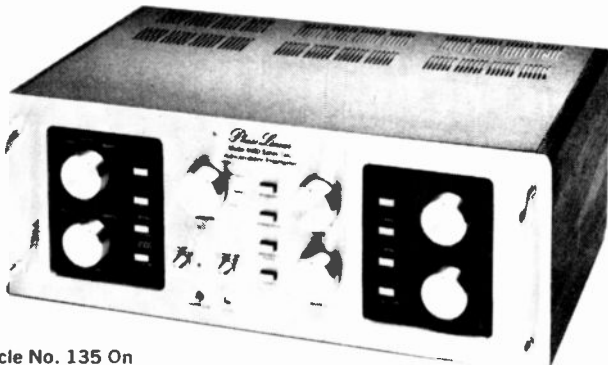
**PERFORMANCE—AM TUNER:** Sensitivity depends almost entirely on the FM antenna being used. The background noise level was considerably less than

average and overall sound quality appeared to be considerably above average, about the best we've heard in AM tuners. Use of the local position of the DX/LOCAL selector places an attenuator in series with the AM antenna input. This eliminates virtually everything except the local "powerhouse" station. We can't see where there's any point to using other than the DX mode. The instruction manual is very confusing on this feature.

The tuner is basically a superb performer; particularly the automatic wide/narrow FM selectivity feature. Unfortunately, there are also a few features, such as the FM center channel tuning meter calibrated in kHz deviation, that are not really necessary. The owner's manual focuses its attention on the not-too-useful features rather than going into greater detail on the really important ones. The writing itself is often difficult to understand, as well. In short, with a bit of rewriting, this manual could become a real boon to the user, rather than a source of confusion.

Best bet when checking out this tuner in your local audio showroom is to focus your attention on the important operating features (as discussed above) which are, without doubt, all real winners. ▲

## TEST REPORTS/PREAMPLIFIERS



Circle No. 135 On  
Reader Service Card

### PHASE LINEAR 4000 SERIES TWO PREAMPLIFIER

A preamplifier for the sound experimenter. In addition to the dual turnover bass and treble controls, subsonic filter, independent tape input selector, and other features, it includes a dynamic noise reduction system called auto-correlation. Price is about \$650.

**DESCRIPTION:** A stereo preamplifier featuring a dynamic range expander (called a "peak unlimiter"); an active boost equalizer for the deep bass independent of the tone controls; and a dynamic post-noise-reduction system (called auto-correlation). Other features include dual turnover bass (40, 150 Hz) and treble (2,000, 8,000 Hz) tone controls; a subsonic filter (called

an infrasonic filter); independent tape input selector for source, phono #1, and tuner; automatic tape dubbing from/to either of two recorders, and tone control defeat.

Inputs are provided for two magnetic phono, tuner, aux, and two tape machines. There are outputs for two line level ("bridged"), two tape machines, and headphones.

Controls are provided for volume, balance, ganged bass, ganged treble, peak-unlimiter threshold, correlation (noise reduction system) threshold, input selection, tape input selection, and auto-dub selection. A recessed screwdriver-adjustable control for the low frequency noise reduction threshold is located on the front panel. There are switches for power, infrasonic filter, correlator, peak unlimiter, tone control defeat, bass turnover frequency, treble turnover frequency, active equalizer, 20 dB audio mute, stereo/mono, tape monitor 1, and tape monitor 2.

Three switched and three unswitched AC outlets are provided.

Overall dimensions are 19 in. wide x 7 in. high x 10 in. deep. Weight is 18 lbs.

**PERFORMANCE—AMPLIFIER:** Note: Though the rated output is 2 volts, tests were conducted at 1 volt, which is more typical of high fidelity equipment.

The frequency response measured  $\pm 0$ —1 dB from 20 to 20,000 Hz at a distortion no higher than 0.025% THD at any frequency.

The tone control range depends on the selected turnover frequency. At 50 Hz: with a 150 Hz turnover the range measured  $\pm 11.5$  dB; it was  $\pm 7$  dB with a 40 Hz turnover. At 10,000 Hz: the range was  $\pm 11$  dB

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with an 8k Hz turnover;  $\pm 7$  dB with a 2k Hz turnover.

The magnetic input hum and noise referenced to a 3 mV input and 1 volt output measured 76 dB; stereo separation was into the noise level.

The output is free of clipping up to 10 volts; clipping commences at 10.2 volts.

**PERFORMANCE—SOUND PROCESSORS:** The active deep-bass equalizer provided a 6 dB boost at 50 Hz and 9 dB boost at 20 Hz. It is recommended, by the manufacturer, for a general equalization (full-time) in order to "extend and flatten low frequency response of speaker system." (It can, and does produce a "muddy" bass on speakers which have sufficient low frequency performance.)

The infrasonic filter, which is rated for  $-24$  dB octave below 15 Hz, provided only a 1.2 dB attenuation at 20 Hz.

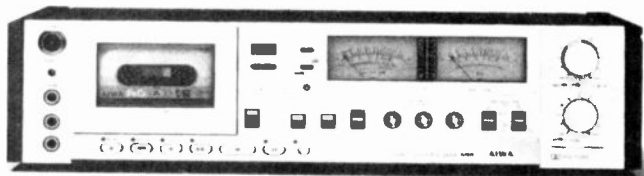
The peak limiter provided approximately 7.5 dB dynamic range expansion: 1.5 dB for the loud passages, 6 dB for the low level passages. It has a remarkably smooth transition free of surges, and provides a "larger than life" effect. In short: it works well.

The threshold adjustment is easy to make, thanks to a rather precise LED threshold indicator which clearly defines the optimum adjustment.

The auto-correlator noise reduction system works on both the highs above 2,000 Hz, and the lows below about 100 Hz. It is very effective at suppressing turntable rumble, though at low program levels it sometimes also attenuates the deep bass of the program material. These days, few program sources have the continuous high frequency noise that can be most effectively "filtered" by the auto-correlator. Clicks and pops, the more common record noises, are handled poorly, if at all; a dynamic click/pop filter is much more effective. When the auto-correlator does get a chance to work, it is quite good, with little apparent effect on the high frequencies, though program sources with substantial moderate level material tend to confuse the system, and the highs drift in and out of the filtering action.

If you have program sources with considerable continuous high frequency noise, the auto-correlator is probably as good a solution to the problem as any other idea. ▲

## TEST REPORTS/CASSETTE DECKS



Circle No. 128 On Reader Service Card

### AIWA AD-6700U CASSETTE DECK

The first of the metal-tape-handling cassette decks tested by our laboratory brings reports from the listening panel of absolutely outstanding high end sound quality (with metal tape) when recordings are made with top-notch microphones. Features include bias fine adjustment for Normal, ferrichrome, and chromium dioxide tapes, electronic remaining time indicator, and automatic end-of-tape stop/continuous repeat play option. \$750, in metal cabinet.

**DESCRIPTION:** A front-loading, two motor drive, Dolby cassette deck for ferric, ferrichrome-bias, chrome-bias, and metal tapes. Features include: preset metal bias; individual bias adjustments for ferric, FeCr, CrO<sub>2</sub> tapes, with each adjustment calibrated for several popular tapes; equalization selector for all tape types; automatic switching to the chrome-bias mode when the cassette has the appropriate coding notches on the rear; an electronic remaining time indicator which utilizes the dual-function left VU meter; calibrated left and right record level metering; a 9-step LED peak

record level indicator calibrated from  $-15$  to  $+10$  dB with selectable "peak hold"; automatic end of tape stop or continuous repeat play; timer-controlled start and record; automatic record by a matching record player when the tonearm is lowered; a memory reset counter with stop or replay after rewind; a record mute (disables input signal while tape drives) with an indicator that blinks approximately once each second as long as the mute is held on; wireless remote control of all tape drive functions including the record mute.

There are inputs for microphones and line. Outputs for line and phones.

Controls are provided for concentric-clutched left and right record level, ganged output level, ferric bias level, FeCr bias level, and CrO<sub>2</sub> bias level. There are switches for power, VU/tape time left meter function, input selection, bias selection, equalization selection, Dolby/mpx filter selection, LED record level peak hold, memory rewind function, timer-control selection, and counter reset.

The tape mechanism has touch-buttons for the record interlock, rewind/review, play, fast forward/cue, stop, pause, and record mute. There is a lever for eject. (The remote control unit duplicates all these controls.)

Overall dimensions measure  $17\frac{3}{4}$  in. wide x  $4\frac{3}{4}$  in. high x 12-15  $\frac{1}{16}$  in. deep. Weight is 20.9 lbs.

**PERFORMANCE:** The playback frequency response from a standard test tape with a 40 to 12,000 Hz range measured  $+0/-1.2$  dB.

Using Fuji-FX tape: without Dolby, the record/play frequency response measured  $+0.6/-1.5$  dB from 40 to 15,000 Hz; down 3 dB at 30 Hz. Distortion at the meter-indicated 0-VU record level was 1% THD with 7 dB headroom to 3% THD. The signal-to-noise ratio



referenced to 0-VU record level was 47 dB.

With the Dolby active, the record/play frequency response measured  $+0/-1.5$  dB from 40 to 15,000 Hz; down 3 dB at 30 Hz. Distortion and headroom remained the same. The signal-to-noise ratio measured 54 dB wideband; 57 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured  $+0.8/-1.5$  dB from 40 to 15,000 Hz; down 3 dB at 30 Hz. Distortion at the meter-indicated 0-VU record level was 1.4% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 55 dB wideband; 60 dB narrowband.

Using TDK-SA (chrome-bias) tape: with Dolby, the record/play frequency response measured  $+0.5/-1.5$  dB from 40 to 15,000 Hz; down 3 dB at 30 Hz. Distortion at the meter-indicated 0-VU record level was 1% THD with 5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 55 dB wideband; 59 dB narrowband.

Using TDK MA-RC60 metal tape: with Dolby, the record/play frequency response at 0-VU record level, a level not used to measure standard cassette tape because standard tape has severe high frequency saturation, measured  $+2/-2.8$  dB from 20 to 15,000 Hz. At the *standard*  $-30$  dB test level when using Dolby, the record/play frequency response was almost identical. The major difference was that at 0-VU record level the response was down 2 dB at 15,000 Hz, at  $-30$  dB record level the response was  $+2$  dB all the way to 20,000 Hz. (We normally don't give measurements beyond 15,000 Hz because it is almost impossible to go to 20,000 Hz with standard tape). Distortion at the meter-indicated 0-VU record level was 1% THD with 5 dB headroom to 3% THD. (A sort of valueless specification because this tape does not saturate at the high end; hence, its 5 dB midband headroom is usually more valuable than a possible 10 dB headroom from a standard tape. We are going to need a new set of test parameters for metal tape.) The signal-to-noise ratio referenced to 0-VU record level measured 54 dB

wideband; 58 dB narrowband.

The maximum output level corresponding to a 0-VU record level was nominally 0.4 volts. Wow and flutter measured 0.05% steady.

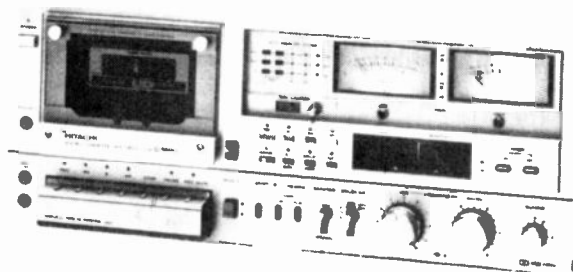
The peak record level indicator was extremely accurate (for an LED indicator), with the LEDs snapping on, rather than fading on and off. An indicated "peak level" for each type of tape was excessive. Use our headroom values as guidelines. The peak hold function was excellent; it's faster than the eye can see. The metered time remaining indicator was notably accurate, especially considering that it includes scales and/or calibrations for all the various lengths of playing time available in cassettes. The next best thing would be a considerably more expensive electronic counter.

The listening panel reported an absolutely outstanding high end sound quality from metal tape when recording with good to excellent (condenser) quality microphones. The 0-VU level high end capacity is obvious on playback. When dubbing other recordings, however, they generally have a high end frequency distribution that does not require the extra high end capacity of metal tape and there is little, if any, difference in sound quality between metal and any other superior "standard" tapes. If the sound source has high level high frequency energy, once again the metal tape's performance is noticeably superior.

Though the machine does not have a built-in bias test oscillator or system, each control is specifically calibrated for several popular tapes, though one of them is TDK-SC, which is no longer available in the U.S. The calibrations proved quite accurate for all except BASF III tape.

#### PERFORMANCE — REMOTE CONTROL MECHANISM:

The remote control was effective to a range of approximately 25 feet, covering an angle of about  $\pm 60^\circ$ . It is an infra-red system and must be beamed directly at the receiver, which is built into the front panel of the deck. ▲



Circle No. 72 On Reader Service Card

**DESCRIPTION:** A front-loading, dual capstan, computerized Dolby cassette deck featuring a three-head system (simultaneous record and play), a computerized transport module that also serves as a full-function wireless remote control, and microphone/line mixing.

One of the two on-board microcomputers has its own automatic test system that in a few seconds automatically establishes the optimum bias, equalization, and

### HITACHI D-5500 CASSETTE DECK

Astounding, astonishing and outstanding. See *Spotlight* elsewhere in this issue. The two on-board microcomputers make this cassette deck a real show-stealer. One microprocessor controls the operation of the automatic bias/equalization/sensitivity optimization system. Another microprocessor is used to run the remote control module that doubles as the function control panel when plugged into the front panel of the machine. The computerized optimization system works like a dream. The only word to describe it is **SUPERB!** \$1200, with wood-grain metal finish.

sensitivity parameters for Normal, ferrichrome, and chrome-bias tapes. A line/battery memory power system "remembers" the last computerized adjustment even when the power switch is turned off. Alternately,

## TEST REPORTS / CASSETTE DECKS

up to three non-volatile memories can be programmed with the parameters for any three types or brands of tape. A computer/memory panel indicates which tape and type (normal, chrome, etc.) has been programmed for use. A "manual" mode is factory-adjusted for the three basic tape groups, and will provide "standard" parameters unless the memory or computer test is "punched up." The memories are reprogrammed at the touch of a button.

Other features include: left and right calibrated VU meters; bias and sensitivity meters indicating the adjustments of the computer as the computer test system sets the adjustments; a three-step LED peak record level indicator (0, +3, +7 dB); fixed or variable line level outputs; a memory reset counter; and a selector which offers the following three options for record/play: automatic end of tape stop/disengage, or automatic reverse and stop, or automatic reverse and repeat play.

There are inputs for microphones and line. Outputs for fixed and variable line level, and phones.

Controls are provided for concentric-clutched left and right line level, concentric-clutched left and right microphone level, and ganged output level. There are switches for power; tape source monitor; Dolby/Dolby with mpX filter; Normal, ferrichrome and chrome-bias tape selectors; manual parameters (factory adjustments); TEST (computerized tape parameters); three computer memories (M1, M2, M3); auto-reverse with stop; auto-reverse with play; and counter memory on-off. There are switches on the rear for variable/fixed line level output and computer reset.

All tape drive functions are provided in a module that can be removed from the front panel to serve as a computer-validated wireless remote control (via an infrared beam of light). When plugged in, the module receives power from the deck. When removed, power is automatically provided by four internal AA batteries. LEDs on the deck indicate which function is in operation for both direct and remote control. The functions are: record interlock, REW, forward, FF, stop, pause, and record mute (disables the signal source while the tape drives in the record mode). The module also provides a "flying start" record by simply holding down the play and record buttons while the tape is playing (the machine instantly shifts from the play to the record mode).

Two pushbuttons on the deck serve as the cassette eject and the control module release (eject).

Overall dimensions measure 17.1 in. wide x 7.3 in. high x 12.6 in. deep. Weight is 30.9 lbs.

**PERFORMANCE:** Note: All tests were conducted only in the computerized mode because this provides the optimum performance.

The playback frequency response from a standard test tape with a 40 to 12,500 Hz range measured +1.8/-1.2 dB from 40 to 10,000 Hz, down 3 dB at 12,500 Hz.

Using Maxell UD/XL Type I tape: without Dolby, the frequency response measured +1.4/-0.6 dB from 25 to 15,000 Hz, down 2 dB at 20 Hz. Distortion at the meter-indicated 0-VU record level was 0.08% THD with 7 dB headroom to 3% THD. The signal-to-noise

ratio referenced to 0-VU record level measured 51 dB.

With the Dolby active, the record/play frequency response was identical to non-Dolby out to 14,000 Hz; it was down 2 dB at 15,000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level was 54 dB wideband; 61 dB narrowband.

Using Sony ferrichrome tape: with Dolby, the record/play frequency response measured +1.5 -0.7 dB from 25 to 15,000 Hz, down 2 dB at 20 Hz. Distortion at 0-VU record level was 0.09% THD with 7 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 54 dB wideband; 63 dB narrowband.

Using Maxell UD XL Type II (chrome-bias) tape: with Dolby, the record/play frequency response measured +1/-1.4 dB from 25 to 15,000 Hz; down 2.2 dB at 20 Hz. Distortion at the meter-indicated 0-VU record level was 0.07% THD with 8 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 53 dB wideband; 61 dB narrowband.

The maximum output level corresponding to a 0-VU record level measured nominally 480 mV.

Wow and flutter was a "rock steady" 0.05%.

The peak indicator lamps were precisely calibrated at 0, +3 and +7 dB.

**PERFORMANCE—COMPUTER:** One word describes the computer operation: *SUPERB*. It works like a dream. Simply load a tape, enter the general type (chrome-bias tapes with the special cassette notch automatically enter the chrome information, otherwise the computer "defaults" to NORMAL. Ferrichrome must be deliberately punched in) and touch the TEST button. The tape starts, the computer computes (some lights blink to let you know the computer is making adjustments), and after a few seconds the tape stops, rewinds to wherever it was started, and the machine is adjusted, ready for recording. A memory remembers the adjustments even when power is turned off (two AA cells in the back of the cabinet serve as a memory power backup). For "permanent memory" you can enter the computer values in one of three user-programmed memories. If entered, you can reset the ideal parameters by simply touching the appropriate memory button.

The precision of the computer is absolutely astounding: we have never seen or attained better tape alignment and/or adjustment. The sound is often spectacular.

The only problem is that of finding suitable tape. If the computer test happens to run on a poor section of tape the computer gets programmed incorrectly ("garbage in = garbage out"). You must be certain to use consistent tapes. We tried many brands, and the only ones we found sufficiently consistent were the TDK AD and SA tapes and the Maxell UD/XL types. Some of the best known, highest rated tapes (by other publications), proved too inconsistent for effective computerization.

The computerized remote control was effective to a distance of about 25 feet over a range of about  $\pm 50^\circ$ . The control must be beamed directly at the front of the recorder. ▲



Circle No. 10 On  
Reader Service Card

**TEAC MODEL 124 SYNCASET  
CASSETTE DECK**

Features Syncaset, a feature that allows users to record on one track first, and then monitor that track while recording a second track in perfect synchronization. Other features include microphone blend, two-position bias/EQ selection, and memory reset counter. \$449 in metal cabinet.

**DESCRIPTION:** A front-loading Dolby stereo cassette deck featuring *syncaset*, a means whereby the user can record on the left track, then monitor the track while recording on the right track in perfect synchronization. On playback, both tracks are blended (*cross-feed*) for syncro-playback through both channels. Other features include: a microphone *blend* whereby a microphone signal can be fed equally into both channels and mixed with the normal line level inputs, or it can be blended into the playback (normal stereo microphone recording is also provided); bias and equalization selectors for *NORMAL* and chrome-bias tapes; left and right calibrated VU meters; automatic shut-off/disengage at the end of play; and a memory reset counter.

There are inputs for microphones and line (left microphone input for *BLEND*). Outputs for line and phones.

Controls are provided for left record level, right record level, and *MIC BLEND*. There are switches for power, microphone/line input, bias selection, equalization selection, Dolby, Simul-Sync recording, *CROSS-FEED* play, and counter memory on-off.

The tape mechanism has lever controls for the record

interlock, REW, forward, FF, stop, pause, and eject.

Overall dimensions measure 16-15/16 in wide x 6 1/8 in. high x 11 5/8 in. deep. Weight is 16.5 lbs.

**PERFORMANCE:** The playback frequency response from a standard test tape with a 40 to 12,500 Hz range measured +1.4/-1.2 dB from 40 to 10,000 Hz; down 4 dB at 12,500 Hz.

Using TDK-D tape: without Dolby, the record/play frequency response measured +1.5/-2.2 dB from 30 to 10,000 Hz, down 4 dB at 11,000 Hz. Distortion at the meter-indicated 0-VU record level measured 1.2% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 45 dB.

With the Dolby active, the record/play frequency response measured +2.5/-3 dB from 30 to 9000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level measured 48 dB wideband; 58 dB narrowband.

Using TDK-SA tape (chrome-bias), for which the machine was factory adjusted: with Dolby, the record/play frequency response measured nominally ±3 dB from 30 to 13,000 Hz, with a peak of +5 dB from 5000 to 8000 Hz. Distortion at the meter-indicated 0-VU record level was 1% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 50 dB wideband; 60 dB narrowband.

The output level corresponding to a 0-VU record level was 0.3 volts.

Wow and flutter measured 0.14%.

In the Simul-Sync mode, the left channel is held in the play mode while the right channel is switched to the record mode. If the user monitors the left channel while recording on the right, the right recording is in exact head alignment with the left recording. On playback the two are in perfect sync. This permits the user to play-along if he or she is a musician, perhaps recording the melody on one track and the harmony on the other. Or a teacher might record one track, which the student monitors while recording on the other. Essentially, it's multi-channel recording—not sound-on-sound (S.O.S.) recording. On playback, the user has the option of blending the two channels together for a composite output, or the channels can be reproduced in full stereo: left track from the left speaker; right track from the right speaker. On playback, a mono microphone (equal in both channels) can be blended into the multi-track playback, with the new composite fed to a second recorder. ▲

**TEST REPORTS / RECORD PLAYERS**

**AKAI AP-207  
AUTOMATIC TURNTABLE**

A two-speed fully automatic turntable with the option to also choose semi-manual operation and continuous repeat play. Performance is in keeping with its price level. Overhang gauge is a ring that's embossed in the turntable's rubber mat—unusual but not easy to use. \$200, including integral base and dust cover.

**DESCRIPTION:** A two-speed (33, 45 rpm) automatic record player with integral base and dust cover. At end of play the tonearm recycles back to the rest and the motor is turned off. Continuous repeat play and semi-manual operation are provided. Special arrangement of the controls permits the tonearm to be manually positioned: at the end of manual play the tonearm lifts but does not return automatically to the rest.

Features include 33 and 45 rpm pitch controls and full-time illuminated strobes around the rim of the plat-

## TEST REPORTS / RECORD PLAYERS



Circle No. 62  
On Reader Service Card

ter for both speeds. There are controls for speed select, 33 pitch, 45 pitch, tonearm indexing (12, 10, 7 inches), start reject, repeat play, tonearm lift.

The tonearm has a micro-adjust counterweight that also serves as a 0 to 3 gram vertical tracking force (VTF) calibrated in 0.1 gram increments. There is a

calibrated anti-skate. The pickup mounts in a universal plug-in shell (carrier). The overhang gauge is "ring" embossed in the turntable's rubber mat; the pickup is adjusted so the stylus is directly over the ring when the tonearm is centered over the platter's spindle. The tonearm rest has a positive lock. The output cable capacity is 120 pF.

**PERFORMANCE:** Both speeds held constant with total immunity to transient line voltage variations over an applied test range of 90 to 140 volts. The pitch control range measured +5.5/-4.5% at 33 rpm; +7/-6% at 45 rpm. Wow and flutter measured 0.05% with peaks to 0.08%.

The tonearm's VTF calibrations were accurate to 0.1 gram.

The overhang adjustment—aligning to a ring in the rubber mat—is considerably more difficult than using a shell gauge; take care not to damage the stylus when making the adjustment.

The turntable's sensitivity to external shock and vibration was considerably higher than average. It's not recommended if the supporting structure is on a shaky floor. ▲

### MITSUBISHI DP-EC10 AUTOMATIC TURNTABLE

An automatic turntable that offers excellent resistance to external shock and vibration and notably excellent installation aids, both in the form of an extensive stylus overhang gauge and detailed measurement data. Features include optical record-size sensors and a tonearm locking mechanism that doubles as a power on/off switch. \$400, including base and dust cover.



Circle No. 78 On Reader Service Card

**DESCRIPTION:** A two-speed (33, 45 rpm) automatic or manual start record player with integral base and dust cover. In either mode, at the end of play the tonearm returns to its rest and the motor stops, but power to the unit is not turned off until the tonearm lock—on the rest—secures the tonearm. (The tonearm cannot be moved when the power is turned off.) The mechanism can also be programmed for *repeat play*.

Optical sensors built into the platter's mat determine 12-inch and 7-inch automatic tonearm indexing. A 10-inch record will automatically index at 7 inches, and, therefore, the tonearm must be manually positioned for 10-inch records, as is done for almost all modern record players. In the automatic mode, the tonearm won't drop if there is no record on the platter: the tonearm will sweep above the platter to the end and then return to its rest.

Individual pitch adjustments and full-time illuminated strobes are provided for both speeds. In addition to the pitch adjustments, there are controls for speed select, repeat play, start-stop/lift-cue, and master power (part of tonearm-rest locking mechanism).

The tonearm has a micro-adjust counterweight that also serves as a 0 to 3 gram vertical tracking force (VTF) calibrated in 0.1-gram increments. There is a

calibrated anti-skate. The pickup mounts in a plug-in universal carrier for which a rather extensive adjustment gauge and set of measurements are provided (stylus position, distance from mounting surface, etc.). The output cable capacity is 60 pF.

**PERFORMANCE:** Speeds were somewhat sensitive to the applied line voltage. With 120 Volts as the reference, at 140 volts the speed drift was +3.3%. At 100 volts the speed drift was -5%. (An overall +8% variation.) Line voltage transient variations, as might be caused by the start-up of a refrigerator on the same circuit, can be heard as a very brief "variation." The pitch control range measured +8/-6% at 33 rpm; +9.5/-8% at 45 rpm. Wow and flutter measured 0.04%.

The tonearm VTF calibrations were essentially on the mark.

Note: Using the strobe pattern as reference, the pitch adjustment was somewhat "finicky"—a slight touch on the controls caused the strobe pattern to drift. The resistance to external shock and vibration was excellent. Unusually thorough pickup gauge(s), measurements, and adaptors permits optimum positioning and adjustment of the pickup. ▲

## TEST REPORTS / HEADPHONES

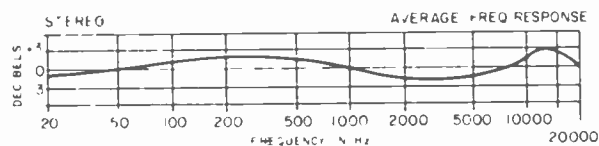


Circle No. 134 On  
Reader Service Card

### NAGATRONICS 195IE PHONO PICKUP

Good sound quality for a pickup in this price range, with slightly below average high frequency definition. \$95.

**DESCRIPTION:** A stereo magnetic pickup with a 0.3 x 0.7 elliptical stylus. Pickup is supplied factory-installed in a universal headshell with 55 mm. (stand-



ard) between rear of shell and stylus tip. Recommended vertical tracking force is 1.5 to 2.0 grams and essentially similar results were attained anywhere within this range.

**PERFORMANCE:** The frequency response measured within  $\pm 2$  dB from 20 to 20,000 Hz. Channel balance was exact, the frequency response from each channel overlapped. The worst-case stereo separation measured 21 dB at 1000 Hz; 22 dB at 15,000 Hz. ▲

## TEST REPORTS / HEADPHONES



Circle No. 103 On  
Reader Service Card

### SENNHEISER 430 HEADPHONES

A very comfortable pair of headphones, offering higher than average efficiency and extremely clean sound quality. Suspension headband is somewhat difficult to adjust for optimum fit. \$119.

**DESCRIPTION:** 7-ounce stereo headphones with suspension headband and circumaural ear cushions. A 9-foot cord is also provided.

**PERFORMANCE:** A very comfortable pair of headphones with very light pressure on head and ears. Suspension headband is somewhat difficult to adjust for optimum fit. Sound quality is slightly bright. Definition is exceptional. Efficiency is much higher than average, and headphones can be driven to high sound levels with relatively little power. Extremely clean sound. ▲



Circle No. 94 On  
Reader Service Card

### SONY DR-Z7 HEADPHONES

A comfortable pair of headphones with well-balanced sound quality and extremely good efficiency. \$100.

**DESCRIPTION:** 12-ounce stereo headphones with sling headband and pressure ear cushions. A 6-foot

cord is also provided.

**PERFORMANCE:** A generally comfortable pair of headphones, with moderate pressure on ears and moderate overall weight. Sound quality is very slightly bright, but overall it's well balanced. Definition is average for this price range. Efficiency is extremely good; these phones deliver a lot of sound with little power. An especially good choice for use with lower powered amplifiers. ▲

**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.**

teries. (Among other things, this saves wear and tear on the batteries.)

The second microprocessor is the *biggie*, for it not only provides a tape test system, it also has four memories—three “permanent” and one test-volatile.

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## SOUND PROBE: RTR

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(Continued from page 64)

pelted the speaker with the sharp, sudden dynamic contrasts of a Prokofiev piano sonata. We asked it to spell out the intricate polyphony of a Bach organ fugue, demanding clarity while the organist was practically standing on the pedals. After the heaven-storming opening of *Also Sprach Zarathustra* we switched to a delicate Haydn quartet and a couple of Schubert songs, winding up with Pink Floyd and bit of the Bee Gees.

None of this revealed any fault of weakness in the speaker. As for its many good qualities, they are so well balanced that it is hard to single out any particular one. Throughout its varied ordeal, the 300D behaved just as a good speaker should: It remained inobtrusive, letting us listen to the music without calling attention to itself. It was as if the speaker had decided, in a gentlemanly way, to ignore the difficulties we deliberately threw in its way. In short, we think this is the kind of speaker anyone would like to take home. It weighs 15 lbs though, so bring a strong friend. ▲

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## SOUND PROBE: AVID

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(Continued from page 64)

we want to say it again.

With a frequency response spec of 48 to 20,000 Hz  $\pm$ 3 dB, the speaker might be a bit weak in the very lowest range. Yet thanks to its tightly controlled woofer, it easily takes a bit of bass boost from the amplifier without becoming boomy. That way we achieved a very satisfactory overall balance that made even fully scored orchestral passages altogether credible. Admittedly, the pedal notes of a great pipe organ or a wallowing rock bass will not cause earthquakes when played on the Avid 110. But hard rockers and organ buffs are hardly prime candidates for this speaker. The rest of us would have to look hard for anything better for the money. ▲

The latter type's contents are changed each time a tape is run through the test procedure. The memories are separately powered through the line cord even when the power switch is turned off. A battery back-up keeps the memories “alive” even if the line cord is pulled from its AC outlet.

The computer has a built-in set of playback reference standards. It includes a bias adjuster, a midband record equalizer, a high frequency record equalizer, and a record level (sensitivity) adjuster—all of which work in conjunction with each other to obtain the reference playback results. All this is determined by five frequencies fed out of an internal test oscillator that is computer controlled. When the TEST button is pressed, the computer commands the test oscillator to output specific signals. The simultaneous playback provides the computer with an almost instant performance check. The computer adjusts the appropriate recording parameters for each test tone before signalling the oscillator to proceed with the next tone. A series of panel LEDs and two meters show the user which tests are being performed and which adjustments are being made.

Once a test has been run, the computer “remembers” the adjustments even if the power switch has been turned off. The next time power is turned on, the recorder “comes alive” properly adjusted for the last tape tested.

But what if you use several types of tape? That's where three direct access memories come in. Once you have tested a particular tape you can enter the recording parameters in any of three memories at the touch of a button labeled M1, M2, or M3. For example, you might program M1 for your favorite ferric (Normal bias) tape, M2 for your favorite FeCr (Ferrichrome-bias) tape, and M3 for your favorite CrO<sub>2</sub> (High bias) tape. To adjust the recorder when using these tapes you simply need to touch the appropriate button, rather than needing to run through a complete test. While testing changes the parameters of the test-volatile memory, it has no effect on the direct access memories: they are cleared by pressing a reset button on the rear panel, or simply by entering new test parameters directly into the memory.

For those who want to check the results of computerization, the Hitachi D-5500 can be manually programmed for “standard” factory adjustments of ferric, FeCr and CrO<sub>2</sub> tape types by pressing a button labeled MANUAL. Whether you use manual or compu-

terized adjustments, the type of tape must be entered through buttons labeled NOR (ferric), FeCr, and CrO<sub>2</sub>. The machine always defaults to the NOR selection. If the cassette is CrO<sub>2</sub> (High bias type) and has the appropriate coding notches on the rear adjacent to the record lock-out tabs, the machine automatically switches to the CrO<sub>2</sub> mode. FeCr must be manually “punched up.” When a tape is “called” from a direct access memory, its type (ferric, FeCr, or CrO<sub>2</sub>) is automatically provided by the computer.

Figures 1 and 2 illustrate the wonders of the Hitachi D-5500 computer. In Fig. 1, whose traces have been displaced for clarity, each trace shows the results of three separate computerized adjustments. Both top two traces are non-Dolby performance. The top trace is Maxell UD/XL Type II, the second trace is TDK-SA. Note how more uniform the SA tape is at the high end, though the UD/XL tape is within 1-dB match (worst-case). The bottom two traces are the same tapes with the Dolby turned on (with mpx filter, at -30 dB record level). We have never seen this good a Dolby match in any other machine. It's perfect.

Figure 2 is even more interesting. (All traces are with Dolby switched in.) The top trace is from TDK-D tape with a *manual* selection of NOR (ferric) tape. The second trace is the same tape computer-optimized. The third trace is of a real chromium dioxide tape which *does* require a different bias from other high bias tapes. Yet compare the computer-optimized performance of this third tape with traces three and four in Fig. 1. The computer has virtually matched performance. Trace number four in Fig. 2 is an older ferric tape not necessarily known for response above 10,000 Hz. Yet look at it now! The computer extracts frequencies rarely heard (until now) from this tape.

Now if all this is a bit much to believe, grab a handful of assorted tape, trot off to a local Hitachi dealer and try the machine for yourself. One note of caution: If a small light above the TEST switch winks at you, the computer is letting you know that the tape is so far outside any reasonable high fidelity specifications that it can't even be pulled in by the computer. Your best bet in this case is to discard the tape, since there's no way it can deliver even “good-fi” from a modern cassette deck.

For more information on Hitachi's D-5500 (\$1200), see the test report in this issue and circle No. 72 on the Reader Service Card. ▲

models with elegant bases of richly grained wood. Ranging from \$160 to \$375, they all feature straight tone-arms.

Sanyo was the big news-maker at the Show via introduction of its Plus Q25 quartz-controlled, direct-drive, straight-arm, semi-automatic front-control turntable at an industry low of \$179.95—a full \$20 lower than any comparable unit on the scene. It also made news with its Deluxe Plus Q60 at \$600 which keeps tabs on stylus operation—to let you know when it's time for a new stylus.

**Cassette Recorders.** Many manufacturers debuted cassette decks with metal tape recording capability at the CES. While this was no surprise, what did come as a surprise was the pricing of the new models. Six months ago the word was, "Yes, there will be a lot of metal-capable decks on the scene in due time, but they will be priced over \$500." So much for those predictions. U.S. Pioneer came out with such a deck at \$295. JVC bettered that figure with a unit at \$290. But Sanyo decimated those prices completely with a starter model in its line at \$189.95.

Those figures tell a further story. Just as Dolby was once an option at a premium price, but evolved into a basic feature as a virtually "peanuts" price increment, so too, will metal-tape-capability become a basic, minimum-increment feature of true hi-fi cassette decks. But far sooner than Dolby achieved that status, judging by these pricing developments in a span of only a year.

New metal-tape-capable decks were introduced at the CES by Sanyo, with eight models; by JVC, Sansui and U.S. Pioneer, with five models each; Akai and Marantz, four each; Sharp, Optonica, TEAC, three each; Toshiba, Lux, Fisher, Sony, AIWA, two each; and one model each by Tandberg, Eumig, Hitachi, B.I.C., Onkyo and Phase Linear.

Entry-level shoppers with low budgets will find that Sanyo has considered their needs—in the form of its Model RD506 cassette deck, priced at \$99.95. The non-Dolbyized unit features five-point LED input level indicators, along with basic controls and features.

Two-speed (1½ and 3¾ ips) cassette equipment, pioneered by B.I.C., is now available in other brands—namely Fisher and Marantz. The former debuted five models ranging from \$250 to \$500, with two also featuring metal tape capability. The latter offered six decks (plus two dual-speed portables), priced from \$235 to \$775, with four featuring metal tape capability. B.I.C.

continues with four two-speed home models, as well as a new two-speed unit with metal tape capability, plus a two-speed under-dash car player.

Relative to future two-speed equipment, the word is that several companies are looking into the matter of licensing. Which is saying in effect that there will be more such models on the way.

Taking a contrary approach, Nakamichi introduced a three-head, two-speed deluxe cassette deck offering high fidelity reproduction at a speed of 15/16 ips—half the regular speed of most cassette machines. It will sell for \$1,350. It uses advanced head technology to overcome low-speed problems. A microprocessor provides random access (program search) capability for up to 18 selections on one cassette side. Contributing to Nakamichi's development of the above cassette deck is the existence of metal particle tape.

Many owners of cassette hi-fi decks have wished there was such a thing as a cassette "record changer," to extend their listening pleasure without interruption. Their wishes are now a reality via the Lenco RAC10 automatic cassette changer that plays 10 cassettes in sequence. This new Dolbyized version of a machine used in the background music industry is priced at \$695. It is unique in that it can do double duty. It can function as a self-contained player operating through a built-in monitor speaker, in one room, while providing taped sound for reproduction through a hi-fi system elsewhere in the home.

Also notable: Dual Model 839, offering auto reverse in both record and

playback modes, variable pitch control, six-position bias/equalization, including setting for metal. Optional remote control is available. This control also operates Dual Model 650 turntable. Phase Linear's Model 7000 Series Two "Micro-Scan (TM) cassette deck priced at \$1,350. This set marks the firm's entry into the cassette deck field. The Micro-Scan microprocessor detects optimum bias, equalization, and recording/playback level automatically for each tape loaded (including metal). It also automatically adjusts the circuitry for a flat response up to the maximum high frequency range of the tape being utilized.

Among new micro-computer-controlled cassette decks that appeared at the CES were: Marantz Models SD8000 and SD9000, Optonica RT-6502/6; Technics RS-M56, and Sharp RT-4488. These allow you to program a series of taped selections for playback in the sequence desired.

**Reel-to-Reel Decks.** The reel-to-reel tape machine category has settled down to become a small, quiet, but very important part of the total hi-fi industry, with developments of an incremental, evolutionary nature. The few new offerings at the CES reflect that state.

Pioneer's single offering, the RT-909, priced at \$895, is a compact unit with 10-inch reel capacity, fully automatic reverse/repeat capability, closed-loop, dual-capstan transport, 24-segment fluorescent meter and electronic four-digit index. It is a rack-mountable design.

Akai's new offerings consist of two models. The GX-620, a three-motor, three-head deck with 10-inch reel capacity, features GX glass/crystal heads with head life guaranteed for more than 150,000 hours, full-logic solenoid controls, variable pitch control, timer recording capability and "see-through" head cover for editing/head cleaning ease. It is priced at \$750. The GX-255, priced at \$650, is meant for seven-inch reels. It features three motors, a GX record head, two GX playback heads for bi-directional play, and ferrite erase head, full-logic solenoid controls, and mic/line mixing.

TEAC's X-7 is a three-motor, three-head model with seven-inch reel capacity and closed-loop, dual-capstan drive, priced at \$750. It comes in a six-head, bi-directional record/playback automatic reversing version as the X-7R at \$850. Remote controls are available as options for both.

TEAC's X-10 at \$1,000 is a three-motor, three-head closed-loop, dual-capstan drive unit with 10½-inch reel capacity, and pitch control. In auto-

(Continued on page 78)

#### ON OUR COVER

Mitsubishi's DP-EC20 fully automatic turntable includes photo-optical sensors, tonearm lock that doubles as a power on/off switch. \$520. Circle Reader Service No. 78. Coupled to it are three different phono pickups, all recommended as good match-ups with the DP-EC20. Closest to the center of the record is the Denon DL-103d cartridge, whose recommended tracking force range is 1.3 to 1.7 grams. \$267. To its right is the Audio Technica AT-25 cartridge, with an integral headshell and a built-in stylus overhang gauge. \$275. At right, is Shure's V15 IV cartridge, with a tracking force range of .75 to 1.25 grams. It includes a dust and lint remover and a static charge neutralization system \$150. Circle Reader Service Number 93.

reverse form it is the X-10R at \$1,300. Both have optional remote control capability.

**Speakers.** Vertical columnar models, minis and subwoofers—these were the speaker systems that stood out at the CES by virtue of their numbers. And these are three key trends in speaker design. As their proponents explain them, the verticals employ better driver placement relative to superior sound reproduction/propagation, and the drivers are placed in a happier relationship to human ears—at heights that more closely match listening positions. Those backing minis talk about space savings, better integration of speakers into home decor, and “big sound from little boxes.” Subwoofer manufacturers—many of whom also manufacture minis—justify their equipment in terms of it supplying far more realistic bass than can be elicited from even the best two and three-way systems.

“A complete departure from conventional techniques” is how B.I.C. describes its new “SoundSpan” speaker systems. Take the top grill section off and you’ll see something totally unlike the top section of any other speaker system on the market. It contains a “sonic blending projector,” which, essentially, is a layered three-section housing for the speaker drivers that disperses their sound in a “near perfect” 360-degree horizontal pattern with total phase coherency. The happy end result is remarkable stereo imaging regardless of speaker placement or listening position in the room. The series consists of three models, ranging from \$180 each to \$350 each.

Another departure from traditional techniques was made by Onkyo, one of the world’s largest suppliers of “raw” speakers (drivers) that are marketed under many big-name brands. Onkyo came out with a phase-aligned model (F-5000) priced at \$1,000 a pair, featuring proprietary flat-cone midrange and woofer elements, plus an electrostatic-type tweeter with samarium cobalt direct-drive membrane. The flat cones were said to provide faster, more

accurate response at mid and low frequencies, with less distortion and “cone breakup.” They also permit a substantially shallower cabinet design. JVC will be introducing more such units, at lower prices, come 1980.

Acoustic Research added two new speakers to its growing line, now called “The AR Verticals.” One is the Model AR92, priced at \$300 each. Standing 31½ inches tall, it features a 10-inch woofer, 1½-inch dome midrange with semihorn, and a ¾-inch dome high range tweeter, the latter both cooled by Ferro Fluid. The three drivers are arranged in a vertical line, with the two upper range units surrounded by AR’s “Acoustic Blanket” to absorb cabinet front reflections, for better definition. The removable grille has contoured corners. The other, called the AR91 and priced at \$400 each, is similar to the AR92 with several distinguishing features: a 12-inch woofer in lieu of the 92’s 10-incher, oiled walnut veneer in lieu of the 92’s walnut-look vinyl finish, and faceted corners in lieu of the 92’s square ones.

Another company that has added to its columnar speaker models is JBL. Its new L150 is a 41½-inch tall model with an elegant-looking sculptured, tapered grille that comes in a choice of brown, rust or camel. It uses a newly developed 12-inch woofer with a three-inch voice coil, 12-inch passive radiator, five-inch midrange in isolated sub-chamber, and one-inch dome tweeter. It can produce comfortable levels of sound on as little as 10 watts of drive power. Price, \$595 each.

A happy blending of mini and subwoofer technology is apparent in Ohm’s new trio—the Ohm N subwoofer and a pair of Model M mini speakers, priced at \$610 the ensemble. The Model N is a walnut-veneered cube measuring 15 by 16 by 15 inches on a pedestal base containing two 8-inch woofers and two passive 12-inch radiators. It reproduces frequencies from 32 to 140 Hz. The Model M minis measure 7¼ by 4¼ by 4½ inches and utilize a four-inch long-throw Thiele-

aligned woofer and a one-inch soft dome tweeter in a black metal cabinet with rear vent for greater power output. The M’s are made in Japan to Ohm’s specifications.

At the same time that several manufacturers introduced subwoofers to augment bass response, Superex, a major stereo headphone maker, debuted a satellite tweeter module—to augment high frequency response in speaker systems. The Satellite/1 tweeter module, priced at \$89.95 each, features two one-inch soft dome tweeters in a small truncated pyramid cabinet of amber plexiglas whose largest dimension is 10¼ inches. It has an attenuator to match the level of any speaker system it is used with. Its response is ±2 dB from 4,000 to 20,000 Hz.

Perhaps the most exciting development at the Summer CES in speakers was the appearance of three systems from KLH sporting computer technology. Employing an “Analog Bass Computer,” the systems are able to produce deep bass in small sized housings with great accuracy and less distortion than most larger conventional speaker systems. The computer unit, supplied with each pair of the new systems, connects to a component system via the tape monitor circuit or between preamp and amplifier. The device anticipates speaker cone motion by monitoring the output of the power amp and instantly controlling woofer cone excursion, to prevent overload and cone destruction/burnout. Essentially, the computer control maximizes woofer performance so that a small bookshelf system, such as the compact Model KLH3, at \$420 the pair complete with computer, puts out the kind of bass you’d expect from a floor model five times its size. The other two KLH computer-controlled models are the KLH1, a three-way (four-driver) model at \$1,000 the pair, and the KLH2—a three-way model at \$630 the pair.

Also notable: JVC’s Zero Five (\$399) and Zero Nine (\$699) models, featuring ribbon tweeters that use a new diaphragm material. ▲

## OPERA: TATIANA TROYANOS

(Continued from page 56)

either in German or in the Viennese tradition of Italian Mozart, and Miss Troyanos has a total grasp of that style.

One would say that the Amnerises and Santuzzas and even the Adalgisas were merely aberrations, if she was singing “her” repertory as well as ever. But this season in New York, she did not offer nearly as strong a Composer in *Ariadne auf Naxos* as she did in 1976. It was not precisely unsteady, but it sounded less effulgent with more breaks in the voice and much less command of the line. She seemed some-

what vocally tired, the classic situation when a singer has been singing roles that do not agree with her voice. It is to be hoped that any decline can be arrested, for no young mezzo-soprano today offers any more voice, musicality or stage presence than Miss Troyanos.

Her career on records as usual reflects the strength and weaknesses enumerated.

Years ago she was heard in several early operas, now generally not available, but one unusual album which shows the mezzo-soprano at the top

of her youthful form is Mozart’s childhood opera, *Die Gaertnerin aus Liebe*, much better known as *La Finta Giardiniera*. It was sung in German on the Philips recording (6703 039) because the accuracy of the complete version in Italian was suspect. The conductor is the late Hans Schmidt-Isserstedt and the cast included Hermann Prey and Ileana Cotrubas. Miss Troyanos took on the trouser role of Ramiro, and her voice is perfect. She had the coloratura, the right sound and ideal German diction. It is rich, full singing; moving



and eloquently expressed. She has three arias in the piece, and Miss Troyanos finds the right approach to the words so that each of the three sounds different. Even in this very early work of Mozart her character seems more than cardboard.

A year or so later Miss Troyanos appeared even more impressively in Bartok's *Bluebeard's Castle*, a Columbia recording (M34217) led by Pierre Boulez and also starring Siegmund Nimsgern as Bluebeard. Miss Troyanos attacks the Hungarian words as though they are part of her everyday language and handles her difficult role with aplomb and fire. She is indeed as passionate a Judith as can be imagined. One is struck by the wonderful depth of her voice, its colors within the dark contour, and her grasp of the upper and lower register. Again, however, even more impressive than her vocal and musical mastery of her part is the vibrant way she brings her character to dramatic life. All of Judith's terror comes over, and it is a full-scale, well-drawn portrayal.

Soon thereafter she was heard in what I believe is her biggest mistake to date on disc, the title role of Bizet's *Carmen* (London 13115). Sir Georg Solti conducts, and in fact she bailed out the recording after the scheduled Carmen had cancelled. But she shouldn't have been so helpful. The performance, first of all, has no sense of the theater about it, and worse her voice is typically German. She sings with the dark richness that has so characterized her other roles, but without the clarity and finesse with the French text that is essential. This is a thick, heavy Carmen that does absolutely nothing for the role. Additionally, Solti tends toward heavy playing and clumsy tempos which handicap the other performers.

The last two recordings to appear, however, were superb. The first was considered the best, an RCA recording of Purcell's *Dido and Aeneas* (ARL1-3021). This marvelous seventeenth-century opera needs above all richness of tone, smoothness of line and a kind of epic elegance. From her first meas-

ures, one must feel that Dido is not only tragic but a tragic queen of heroic proportions. Under the superb leadership of Raymond Leppard, she attains all that might be expected. She is heroic without becoming statuesque, and her singing is a marvel of phrasing and line. Her "When I Am Laid in Earth," supplies the proper conclusion to a moving performance, and one longs to hear her sing the role onstage.

Her other success is a delight, with reservations, only because her singing is not quite as spectacular as it was in the role two years ago. It is the Composer in *Ariadne auf Naxos*, with which she has long been associated. Her natural ebullience of personality and her poetic view of music drama make her ideal for the Composer, and she soars to Straussian heights with ease, conveying the Composer's complex emotions. Her voice is wonderful; but not quite as full as when she sang the part live in 1976. The Solti recording (London D-13131), which was generally disappointing, was made much more sales-worthy because of her performance. ▲

## SOLVING THE COMPONENTS PUZZLE

(Continued from page 62)

If after reading the foregoing, you still doubt your ability to pick out a hi-fi system, there's an alternative. Put yourself in the hands of a good hi-fi salesman and let him help you. Start off by saying that you have a budget of X number of dollars and that you want the best values possible within its framework. And tell him you will not accept "black-box" (house brand, non-name brand) speakers as part of the total outfit. This will suggest that you are a savvy shopper, and will set the stage for a happier buy.

How do you pick a "good" salesman? That's tricky . . . Your best bet is to ask friends or relatives who recently bought a hi-fi system. Another is to size up the salespeople who ask to help you as you're doing your initial scouting. If they are pushy and impatient, forget about dealing with them. Look for the salesperson who is willing to listen to you, who seems interested in your needs, and who suggests choices or alternate products rather than rigidly specific products.

Another alternative is to buy a store-selected audio system. These are usually excellent buys, representing a store's efforts to come up with something that will enable it to compete in the local marketplace. Such systems often represent special purchases stores are able to make of various individual audio products, with the savings passed on to the consumer.

Stores usually develop systems by "price points," say \$395, \$495, \$595, \$795, \$995, etc., enabling you to "step

up" in your choice. Each price increment generally means one or more of the following: higher power, better specifications, more features, greater operating flexibility or versatility, a wood housing instead of metal, more attractive styling, greater operating ruggedness, or better basic quality.

Selection of such a system is essentially a matter of determining which have the capabilities you need, then listening carefully, and picking the one that sounds best to you.

No matter which selection/buying road you take, bring along a new copy of a favorite record whose sound is totally familiar to you. That will make evaluation a lot easier, and your ultimate choice far more satisfying.

In listening to the equipment that will eventually make up your audio component system, listen for "clean," well-balanced, distortion-free sound that is as close to your concept of natural sound as you can find. Experts suggest that before you go out to buy, that you attend a "live" concert of your favorite kind of music to get a fix on, or refresh your memory of, what natural sound is.

If you live in a difficult reception area, a consideration in buying a receiver or tuner is its ability to bring in stations (sensitivity) and to separate them from others (selectivity). Ask the salesperson to show you models with the best sensitivity and selectivity specifications, and listen carefully. In some areas even top-spec receivers will do only a mediocre job; it will be a

matter of special antenna installation, or buying a quality indoor antenna device such as B.I.C.'s "Beam Box."

In evaluating equipment make sure that you like the control layouts. Logical, "human-engineered" control layouts make operation easier and far more pleasant. Make sure the controls operate easily, without binding or moving erratically. The tonearm movement in a turntable should be smooth and precise, so that the stylus engages the record groove gently, with no sense of impact or downward force.

Functions that were previously indicated by meters are being indicated on the latest equipment by fluorescent, liquid crystal, LED (light emitting diode), and digital displays. Such devices have little effect on the sound quality of the equipment *per se*, but make operation of it more fun.

If you are fortunate enough to assemble your system in one store you have an advantage. You can feel free to ask for a home trial, to make sure that the rig will be appropriate to your surroundings, with a view to possibly substituting an alternate (second-choice) pair of speakers for the ones selected. (Speakers that sounded great in the store may sound different in your home because of excessive reflections due to large bare floor or wall areas, or excessive absorption of high frequencies by plush furniture or thick rugs.)

One of the best bits of advice we can offer is this: Take your time in evaluating the elements of your future

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hi-fi outfit. The more time you spend in listening—both in stores and in the homes of friends or relatives with true hi-fi systems, the better your ultimate choice(s) will be. As noted earlier, you'll find yourself getting educated in hi-fi as you look around, study spec sheets, check prices, make comparisons, and listen. Make notes of your tentative speaker choices, then, after

you've done as much evaluating as you can, go back and *listen again*. You'll be amazed at how much more sophisticated—and critical, your ears have become in the period of your research. That new sophistication is virtually a guarantee that your ultimate choice of speakers will be the right one, the happy one.

Good luck! ▲

## TURNTABLE/CARTRIDGE MATCH-UPS

(Continued from page 42)

by forming the arm from materials—such as titanium or carbon fiber—that have a very high strength-to-mass ratio. To get the mass really low, one may have to forgo the luxury of a removable headshell because the mass of the connector out near the extremity of the arm makes a substantial contribution to the total effective mass. That, of course, is inconvenient for the user who likes to swap cartridges frequently. To boot, the total effective mass of the tonearm includes not only the mass of the tonearm itself, but also that of the cartridge. And, since the cartridge is farthest from the pivot, its mass makes the most substantial contribution to the effective mass. So the benefits accruing to an ultra-low-mass tonearm can be wiped out by a lunker of a cartridge. Apparently, this subtlety is becoming more appreciated, for we see new cartridges being introduced (notably by Ortofon) in which mass reduction is the name of the game.

### Determining Compatibility

How do you tell how well a cartridge's mass and compliance suits a particular tonearm's mass and damping? Theoretically, if you knew the mass, compliance and damping of each part, you could calculate the resonant frequency and the degree of increased sensitivity in that region. But practically speaking, you don't have the necessary data.

Fortunately, there is a test record available that will indicate the resonant frequency of a tonearm/cartridge combination and give you a good idea (at least relatively) of the damping. I'm speaking of the Shure Era IV audiophile test disc (TTR-115) that has vertically-modulated subsonic signals recorded on Band 5 of the second side. The vertical modulation that simulates a warped record is recorded at frequencies of 4, 5, 6, 8, 10, and 12 Hz. Since, even with the best of cartridge/ tonearm combinations, the vertical modulation contaminates the sound of the music that is recorded with it (especially on the 8, 10, and 12 Hz bands), I've found it best to ignore Shure's instructions to *listen* for the effect and use my *eyes* instead.

While playing these test bands, look across the record surface so you can

see the stylus. At one vertical-modulation frequency, you will probably see the stylus vibrate strongly. That tells you the tonearm/cartridge resonant frequency. How violently the stylus vibrates indicates the degree of damping or lack thereof. In a really bad case, the stylus will be tossed right out of the groove. Take this disc with you when you're out shopping for a record player or cartridge, and you can easily check the compatibility of the two. You'll also find the other bands helpful in determining the music trackability of the cartridge and also as a means of determining the minimum tracking force you need to stay in the groove.

The other thing I'd check before buying a turntable is its suspension. If shock or vibration gets through the suspension and vibrates the stylus, the sound will be muddled. And a poor shock isolation can render a system virtually useless if it's not on a rock-stable platform. If your floorboards creak or your mounting platform isn't all that stable, pay especial attention to this point or you're likely to be disappointed when you get home. You can get a rough idea of how good the suspension is by tapping the support shelf and listening for what happens. If the stylus bounces out of the groove with a light tap, beware. Don't forget it's the *relative* motion between the cartridge and turntable that counts. If the turntable and arm are rigidly connected together and bounce in synchronism, no ill effects are likely.

### Choosing a Cartridge

Each cartridge, like each loudspeaker system, has its own subtle peculiarities. Choosing one for someone else is fraught with peril. Since a detailed explanation of the differences among cartridges is beyond the scope of this article—we're really emphasizing compatibility—my best advice is to listen to a number of cartridges yourself using the highest quality discs you have at your disposal. The discs should have lots of midrange and highs for these show up cartridge differences best. But the music should be of the type you like to listen to. As with the sound of speakers, rock fans tend to prefer a certain brightness in the high end that

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classic and opera lovers may find strident and distasteful.

As a general rule of thumb, moving-coil cartridges have a brighter sound than the fixed-coil cartridges (such as the moving-magnet, moving-iron, or variable-reluctance.) They also tend to have a lower compliance and must be tracked at a higher force than their fixed-coil counterparts. (The lower compliance partially or fully compensates for their typically higher-than-average mass so the tonearm resonant frequency need not be out of line.) Moving-coil cartridges are quite tolerant of loading, but since their output voltage is so low, most must be used with a step-up transformer or preamp. Despite their (usually) high cost and, in many cases, lack of user-replaceable styli, they are the favorite of many an audiophile.

But fixed-coil magnetic cartridges are the most popular by far. They are available at a wide number of price points and usually have user-replaceable styli. The better ones track at very low force and are of quite high compliance. When terminated properly, the better fixed-coil cartridges yield excellent frequency response on the test bench. And typically, they are highly sensitive and afford a good signal-to-noise ratio.

### Splitting the Budget

It's tempting to give a glib answer to the perennial question: how should I split my record-player budget between turntable, arm, and cartridge?

## JAZZ: SONNY ROLLINS

(Continued from page 15)

an anti-climax to his "retirement." *Pure Gold Jazz* (RCA Camden) followed, with a celebrated version of "The Night Has a Thousand Eyes."

Unfortunately, Rollins' more experimental work from the early 1960s has long been out of print, except on French RCA imports. Most notable here was *Our Man in Jazz* with trumpeter Don Cherry and drummer Billy Higgins from the Ornette Coleman group. Less finished, but more than intriguing, was *Sonny Meets Hawk*. Here Rollins met the saxophone *paterfamilias* Coleman Hawkins in selections which sound less alarming today than they did fifteen years ago. *Now's the Time* (Quintessence), a spirited re-examination of the standard modern jazz repertoire with an outstanding version of "Four," has only recently returned to the catalogue.

On *Impulse* (Impulse) presented Rollins in a similar vein to *Now's the Time*, but allowed more lengthy improvisation, with telling effect on "Three Little Words." *East Broadway Rundown* (Impulse) reunited Rollins with Elvin Jones, but here the selec-

Indeed, simplistic answers are often proffered. In my opinion, there is no simple answer. I've used relatively inexpensive turntables that, in practice, performed as well as more expensive ones. And, I've not found a one-to-one relationship between cartridge cost and performance either.

I don't mean to imply that the more expensive cartridge in a manufacturer's line is no better than the least expensive one. Almost invariably, it is. But, if you don't like the sound characteristics of a certain manufacturer's cartridges, simply buying a more expensive cartridge in that same family is not likely to satisfy your taste. You may find a less expensive cartridge from a different manufacturer that suits you better. When it comes to turntables, the first bucks buy you the most performance. Additional money frequently goes into additional *features*. You may want them and find the investment well worthwhile. Or you may not. It's up to you.

Regardless of how much money you spend, you'll get the most for it by assuring that your turntable, arm, and cartridge mate as a system. Neither arm nor cartridge will provide the performance of which it's capable if the two are grossly mismatched. Nor will you be pleased with the sound if a specific system is so skittish that the stylus loses contact with the groove when you walk across the floor. So compatibility is important, and that's what this article has been about. ▲

tions were over extended, at least for the inspiration of their moment. *There Will Never Be Another You* (Impulse) has several brilliant medleys from a 1965 concert; note however, that the recording quality is chancy. (Also, at this writing, this poorly recorded LP is the subject of a contractual dispute between Rollins and ABC Records—Rollins did not approve its release, and listeners may want to honor his wishes.) *Alfie* (Impulse) was Rollins' version of the music he wrote for the 1965 film—the actual soundtrack was recorded by British musicians—and is notable for the powerful "Alfie's Theme."

Since returning from his most recent sabbatical in 1972, Rollins' recordings have been uneven and at times apparently commercially conceived. Still, there are moments of greatness on the 1972 comeback record *Sonny Rollins' Next Album* (Milestone), with "Easy Living," and the most recent *Don't Stop the Carnival* (Milestone) with "Autumn Nocturne." *Horn Culture*, *The Cutting Edge*, *Nucleus*, and *Easy Living* are all preferable to *The Way I Feel* (all Milestone). ▲

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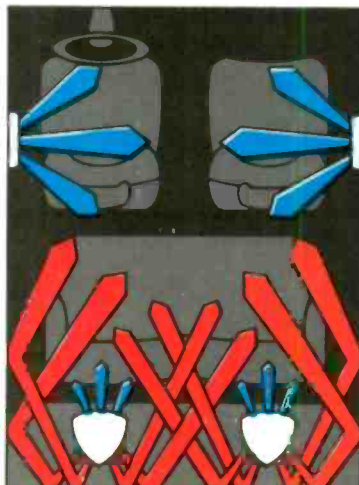
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