SPEAKERS

JULY-AUGUST 1978 $1.35

hi-fi/stereo® BUYERS' GUIDE

SPEAKER OPTIONS

SELECT THE SOUND THAT'S BEST FOR YOU

CHOOSE A SPEAKER BY LISTENING

SIX EXPERTS TELL YOU HOW

SPEAKER SPECS

WHAT THEY CAN AND CANNOT TELL YOU

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HOW TO CHOOSE RECEIVERS

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TEST REPORTS

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A DAVIS PUBLICATION

Record Ecology in DiscKit Form —you'll save more than money

DiscKit is a milled walnut tray and dust cover that saves you 15% with the Discwasher products in the kit. ($46 versus $54 separately)

DiscKit includes: 1) The Discwasher System Record Cleaner with D3 Fluid, 2) the Zerostat anti-static pistol and test light, and 3) the SC-1 Stylus Cleaner.

But you'll save more than money. You'll save your records from imbedded micro-dust, your cartridge stylus from abrasion and your ears from a lot of static.

Record Ecology from Discwasher—a substantial bargain.

(Walnut tray and dust cover are available separately as the Discorganizer, $12.50.)

All from Discwasher, Inc., 1407 N. Providence Rd., Columbia, Missouri 65201.

To get a superb performance, you need a precision machine.

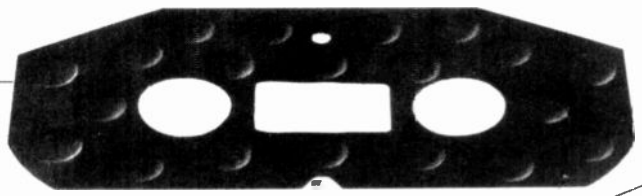
To command a great performance, a cassette shell and cassette tape must be engineered to the most rigorous standards. Which explains why we get so finicky about details. Consider:

Precision Molded Cassette Shells—are made by continuously monitored injection molding that virtually assures a mirror-image parallel match. That's insurance against signal overlap or channel loss in record or playback from A to B sides. Further insurance: high impact styrene that resists temperature extremes and sudden stress.

Five-Screw Assembly—for practically guaranteed warp-free mating of the cassette halves. Then nothing—no dust or tape snags—can come between the tape and a perfect performance.

Perfectly Circular Hubs and Double Clamp System—insures there is no deviation from circularity that could result in tape tension variation producing wow and flutter and dropouts. The clamp weds the tape to the hub with a curvature impeccably matched to the hub's perimeter.

An Ingenious Bubble Surface Liner Sheet—commands the tape to follow a consistent running angle with gentle, fingertip-embossed cushions. Costly lubricants forestall drag, shedding, friction, edgewear, and annoying squeal. Checks channel loss and dropouts.

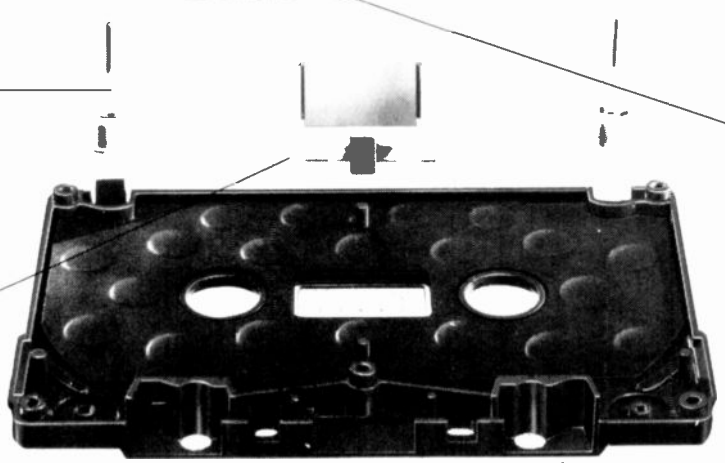


Head Cleaning Leader Tape—knocks off foreign matter that might interfere with superior tape performance, and prepares the heads for...

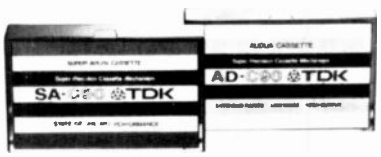
Tapered, Flanged Rollers—direct the tape from the hubs and program it against any up and down movement on its path towards the heads. Stainless steel pins minimize friction and avert wow and flutter, channel loss.

Our famous SA and AD Tape Performance—two of the finest tapes money can procure are securely housed inside our cassette shells. SA (Super Avilyn) is the tape most deck manufacturers use as their reference for the High (CrO_2) bias position. And the new Normal bias AD, the tape with a hot high end, is perfect for any type of music, in any deck. And that extra lift is perfect for noise reduction tracking.

Resilient Pressure Pad and Holding System—spring-mounted felt helps maintain tape contact at dead center on the head gap. Elegant interlocking pins moor the spring to the shell, and resist lateral slipping.



TDK Cassettes—despite all we put into them, we don't ask you to put out a lot for them. Visit your TDK dealer and discover how inexpensive it is to fight dropouts, level variation, channel loss, jamming, and other problems that interfere with musical enjoyment. Our full lifetime warranty* is your assurance that our machine is the machine for your machine. TDK Electronics Corp., Garden City, N.Y. 11530. Canada: Superior Electronics Ind., Ltd.



TDK®

The machine for your machine.

*In the unlikely event that any TDK cassette ever fails to perform due to a defect in materials or workmanship, simply return it to your local dealer or to TDK for a free replacement

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hi-fi/stereo BUYERS' GUIDE

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Cover Photo by Neal Slavin

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Bose 501
Altec Lansing Model 15
JBL L50
Ohm F
Electro-Voice Interface B II
Advent New Advent

Introducing the Koss Theory of loudspeaker design and the three new Koss CM speaker systems that prove it.

Here for the first time is the culmination of a worldwide search for the ultimate in loudspeaker design within the limitations of today's technology and within affordable price restrictions. Indeed it represents a breakthrough in loudspeaker technology of such significance that it heralds the second major revolution in loudspeaker design.

By utilizing a complex series of audio engineering formulas and the precise knowledge of computer science, Koss engineers are now able to derive and produce the optimum system parameters for any loudspeaker. The incredible result of this engineering achievement is the new Koss CM 1010, 1020, and 1030 loudspeaker systems. Each represents the ultimate speaker system available in its price range. And each represents a listening experience you'll have to hear to believe.

Ask your Audio Dealer to let you hear this new, incredibly beautiful, Sound of Koss and to show you how the Koss Theory of loudspeaker design has created a whole new generation of loudspeakers. And if you'd like to have our full-color brochure telling all about the Koss Theory, write for it, c/o Fred Forbes. Once you've heard these revolutionary new loudspeakers, we think you'll agree: hearing is believing.

KOSS® CM LOUDSPEAKER SYSTEMS

hearing is believing™

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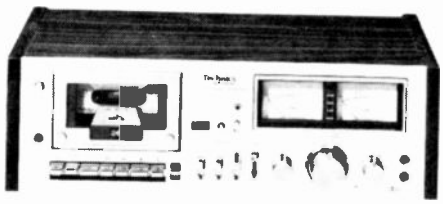
THE LATEST HI-FI COMPONENTS IN OUR... AUDIO SHOWCASE

Cassette Deck with Memory Auto-Play

Technics Model RS-631US front-loading cassette deck features a memory auto-play system which incorporates three possible rewind modes: rewind auto-play in which tape is rewound to the beginning for automatic playback; memory rewind to a pre-selected point; and automatic stop, ready for replay. Separate bias and equalization selectors permit the use of virtually any kind of tape on the market. A pair of large meters share a combined function of indicating the level in VU units or as peak-check meters, with switchover made by a panel switch. Between the meters is a vertical series of three calibrated LED peak-check indicators. An



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MPX filter to eliminate the pilot signal from FM broadcasts when recorded is added to the Dolby system. Other notable features include: hot-pressed ferrite head; full auto-stop; timer stand-by system; FG servo motor; muting circuitry to eliminate "click" noises during recording. Specifications: wow and flutter, 0.06% WRMS; frequency response, 30 to 17,000 Hz with CrO_2 or FeCr tape and 30 to 14,000 Hz with normal tape; signal-to-noise ratio, 67 dB (Dolby in) and 57 dB (Dolby out). Suggested retail price: $299.95.

Ortho Acoustical Speakers

Sonab Electronic's OA-2212 loudspeaker system utilizes a patented Ortho Acoustical principle which is said to blend directional and reflected sound to best advantage. Bass units are mounted in the bottom of the cabinet, near the rear side. This is so that the bass sounds are radiated close to the floor and wall, and the reflected sound is "converted to direct sound." Since bass is normally radiated in all directions, this positioning results in an increase of the ratio of direct to reflected sound and reproduction of bass transients becomes distinct and forceful, according to Sonab. The mid-range speakers are also placed near the rear of the speaker cabinet, but on top, to reflect sound from the wall behind the speaker so that it is reflected less than one millisecond after the direct sound; coming so fast, it does not mask direct sound transmitted later. In the lower part of the mid-range, where a speaker cone 4.7 inches in diameter is nearly omnidirectional, the positioning of the loudspeaker unit has the same effect as increasing the ratio of direct to reflected sound. This is said to improve clarity of reproduction. The total effect: the room seems to be

"open" towards the musicians in the recording studio. Matched pairs of speakers are designated as OA 2212L and OA-2212R, and cost $840 each. Frequency response is put at 30 to 15,000 Hz ±3 dB and power handling capacity is 200 watts.

New High-End Turntable

Kenwood's KD-750 high-end turntable offers such refinements as quartz/phase-lock loop control which functions as a highly effective form of servo control to increase accuracy of the turntable and to reduce speed drift for improvement of wow and flutter down to a low of 0.2% WRMS. Special attention has also been directed to two other performance

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factors, the platter and the direct-drive system itself. The platter's "moment of inertia" is increased in the KD-750 by use of an extra-large (13"), extra heavy (5.7 lb.) platter. Moreover, the rubber platter sheet has been designed to ab-

"The Sansui AU-717 is a superb amplifier. We like it with no ifs, ands, or buts." (Julian Hirsch) It offers "as much circuitry sophistication and control flexibility as any two-piece amplifying system." (Len Feldman)

Everyone says great things about the new Sansui AU-717, but the experts say it best.

The Sansui AU-717 DC integrated amplifier is "Sansui's finest.... It incorporates a fully direct-coupled power amplifier section whose frequency response varies less than +0, −3dB from 0Hz (D.C.) to 200 kHz. The amplifier's power rating is 85 watts per channel (min, RMS) from 20 to 20,000Hz into 8-ohm loads, with less than 0.025 per cent total harmonic distortion ..... If any amplifier is free of Transient Intermodulation Distortion (TIM) or any other slew-rate induced distortion, it is this one ....The slew rate ... was the fastest we have measured on any amplifier, an impressive 60 V/usec.

"The preamplifier section of the AU-717 .... has very impressive specifications for frequency response, equalization accuracy, and noise levels ... The AU-717 has dual power supplies, including separate power transformers, for its two channels ... [and] exceptionally comprehensive tape-recording and monitoring facilities .... Good human engineering .... separates this unit from some otherwise fine products....


Julian D. Hirsch, Contributing Editor Stereo Review

"The Sansui AU-717 is a superb amplifier. We like it with no ifs, ands, or buts." [Reprinted in part from Julian Hirsch's test report in **Stereo Review**, February, 1978.]

"One clear advantage of DC design is apparent. Even at the low 20Hz extreme, the amplifier delivers a full 92 watts — the same value obtained for midfrequency power — compared with its 85 watt rating into 8 ohms....


Leonard Feldman Contributing Editor Radio Electronics

"The equalization characteristic of the preamplifier was one of the most precise we have ever measured, with the deviation from the standard RIAA playback curve never exceeding more than 0.1dB.....

"Sansui claims that this unit has reduced transient intermodulation distortion — a direct result of the DC design, and, indeed, the model AU-717 delivered sound as transparent and clean as any we have heard from an integrated amplifier....

"... worth serious consideration — even by those who prefer separate amplifiers and preamplifiers." [Reprinted in part from Len Feldman's test report in **Radio-Electronics**, January, 1978.]

Listen to the superb sound of the Sansui AU-717 at your Sansui dealer today. And be sure to ask him for a demonstration of the matching TU-717 super-tuner.

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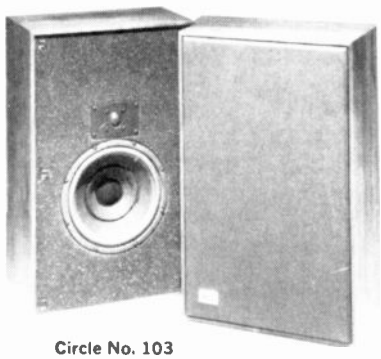
AUDIO SHOWCASE

sorb or cancel vibrations and resonances, especially in the critical 1,000 to 10,000 Hz range. A newly developed 20-pole, 30-slot DC motor with a starting torque of more than 1.5 kg/cm brings the platter to full speed in less than one revolution. The drive system also utilizes a special 180-slot gear which directly transforms the rotational velocity of the turntable into a speed control signal, making it possible for the quartz/PLL control to operate more efficiently. Other features include: a tonearm with a flexible "stand-off" decoupling system to cancel mistracking resonances; all-electronic braking system; micro-switch digital controls. Price: $450.

Evolution 1 Loudspeaker

This "Evolution 1" two-way bookshelf loudspeaker system by AEI, Inc., utilizes a low resonance 10-inch woofer combined with a 1-inch dome tweeter plus a crossover circuit. The enclosure is constructed of ¾-inch thick particle board, instead of standard ¾-inch material, for extra rigidity. AEI manufactures its own woofer, using a 2.2-pound magnet structure, 1½-inch voice coil and foam edge suspension. A switch



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gives the user a choice between either 4 or 8 ohms impedance. The design produces a system resonance of 38 Hz. Specifications: frequency response, +½ db/−2 dB from 35 to 17,000 Hz measured outdoors in a 2-pi environment; power handling, up to 150 watts RMS per channel; minimum power amplifier requirement, 15 watts RMS into 4 ohms; efficiency, 88 dB average sensitivity at 1 meter with 1 watt input into 4.25 ohms; impedance, 4.25 ohms ±.20 ohms from 100 to 15,000 Hz with high frequency control in "normal" position and impedance control in 4 ohms position. Price: $160 with wood finish, $140 with vinyl finish.

Volume-Range Expander

Source Engineering's Model VRE volume-range expander provides two operating modes: an "upward" mode is used with normal program material in which only the top end of the dynamic range is compressed; an "up/down" mode is used particularly with early orchestral and much recent popular material in which the overall dynamics are restricted. In the upward mode, the output level remains the same as the input below a manually adjustable threshold while signals above the threshold level are expanded at the rate of 1.35 dB/dB for a total of 8 dB of upward expansion. In the up/down mode the level of the softest signals is reduced 8 dB, that of the loudest is increased 6 dB, for a total increase in dynamic range of 14 dB at the rate of 1.6 dB/dB. The

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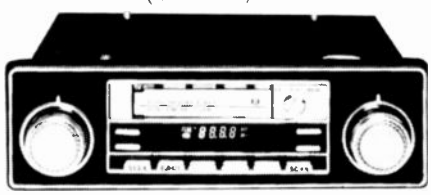
threshold is adjustable over a range of 10 mV to 1 V, and a light-emitting diode glows at the threshold and increases in brightness with increasing level. Two attack times are provided: a fast attack of less than 1 millisecond and a normal attack of 10 msec. There's also fast 100 msec release (decay) time and normal 1 sec release time which is desirable when reverberation is important. Features include: rotary threshold control, six pushbuttons for tape monitor, bypass, fast attack, fast release, up/down mode, power on/off. Retail value is put at $165.

In-Dash Car Stereo Units

J.I.L. introduces two new top-of-the-line "Power Pumper" in-dash car stereo units featuring AM, FM-MPX, Tape Player and Digital Clock. Model 874E ($334.95) is an 8-track version while model 634E ($374.95) is a stereo cas-



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sette version. Both models deliver a maximum of 20 watts RMS power per channel when a power boost switch is activated. These units feature a scan/pause device that continuously scans the AM or FM dial, pausing for seven seconds at each channel before moving on. A second push of the scan button locks in a desired station. A seek/lock feature moves the tuner to the next adjacent station and locks accurately on

fact:
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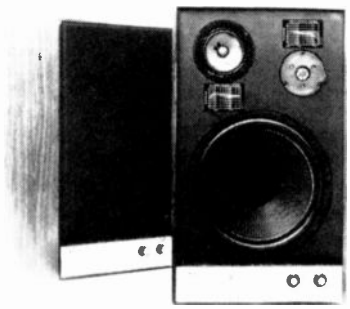
AUDIO SHOWCASE

its frequency. Scan/seek speed can be adjusted. Instead of the conventional AM/FM dial, these units have a fluorescent vacuum display of channel frequency, as well as a time readout from the built-in digital clock. Four programmable push buttons permit selecting four AM and four FM channels. Specifications: wow and flutter, less than 0.35%; frequency response, 40 to 10,000 Hz. Specs for the 8-track model: separation, better than 40 dB; signal-to-noise ratio, 52 dB; wow, flutter and frequency response as already stated.

Scott Bookshelf Speaker

The H. H. Scott company has introduced an improved version of their popular S-196 three-way bookshelf speaker system. The new speaker can be recognized by its black, high-domed tweeter rather than the old, transparent soft tweeter. According to the manufacturer this is the most accurate speaker in their line and offers studio quality sound comparable to systems costing twice as much. The speaker is intended to be neither too bright or too heavy in bass, but rather to faithfully reproduce the original sound with minimal distortion. The modified S-196 system is comprised of a 12-inch, high-compliance woofer, a 4.5-inch cone midrange and a one-inch dome tweeter. The frequency response is reported to be 40 to 20,000 Hz ±4 dB. The maximum power handling capacity is 75 watts and the minimum amplifier power requirement is 15 watts. Each unit measures 24½ inches high by 13¾ inches wide by 11 inches deep, and weighs 50 pounds. Suggested retail price: $199.95.



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Video Cassette Recorder

Panasonic's Omnivision IV VHS home video casette player/recorder is compatible with any black-and-white or color TV set and is capable of recording live or off-the-air program material. The unit utilizes an "M" style cassette loading format: simply insert the compact, ½-inch VHS casestte, then press "play" or "record." This "M" loading feature is said to provide an intrinsically shorter tape path which results in longer tape life, less stress and reduced head cylinder wear. Notable features include: direct drive motor; capstan servo system; built-in electronic digital clock for unattended recording; remote pause control; built-in VHF/UHF tuners that permit recording off-the-air broadcasts while watching another program; auto stop and memory rewind function; audio dub feature for recording independent sound on the video program material. The suggested retail price is $1,095. Extra-cost accessories include: black-and-white handheld camera with built-in microphone (WV-450A), $299.95; external microphone (WM-1240P), $14.95; wide angle adaptor lens for the video camera (VZ-ML10), $39.95; 25-ft. camera extension cable (10H-25), $54.95.

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Citation Rack Mount

Harman/Kardon's Citation Rack Mount can house a variety of Citation systems, as well as a tape deck or turntable. There's also a section for such other uses as storing records, accessories, or liquid refreshments. The rack, priced at $269.95, is here shown with a Citation system consisting of a Model 18 tuner,

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"SPECTACULAR"

and other comments from audio critics about the new Ohm L:

From The Complete Buyer's Guide To Stereo/Hifi Equipment:

"Ohm Acoustics is an adventurous speaker company known for turning mathematical theory into fine sound. They perfected the Walsh driver, and the resulting speaker is one of the finest available at any price.

On a more conventional level, Ohm was among the first companies to take advantage of A.N. Thiele's research into vented loudspeakers, with some pretty spectacular results. The"L" is the latest, most compact, and least costly Ohm Speaker to utilize the Thiele mathematics.

In listening to the Ohm L, the immediate reaction is one of surprise at the openness of the sound. We compared the sound of the "L" with that of several larger and costlier systems, and in no case could we say that the larger systems have a "bigger" sound.

So in this respect, the Ohm L is an unqualified success. In addition, the frequency response of the speaker is exemplary. And the midrange, which is often a weak point in speakers of this size and price is very good. There is no sense of strain, and voices sound utterly natural.

The Ohm L is more suitable for use in larger rooms than its dimensions might indicate, and we recommend it highly."

From Stereo Review:

"In summary, the Ohm L...is easily good enough to meet the sort of critical standards usually applied to much larger and considerably more expensive speaker systems."

"The upper mid-range and high frequencies were virtually perfect."

"The balance between lows and highs was excellent. The Ohm L, though diminutive beside many of the floor-standing or oversize "bookshelf" speakers we have seen, sounded in every way like a full-size system. Blindfolded, one would never guess its compact dimensions."

Ohm

OHM

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OHM ACOUSTICS CORP., 241 Taffee Place, Brooklyn, N.Y. 11205

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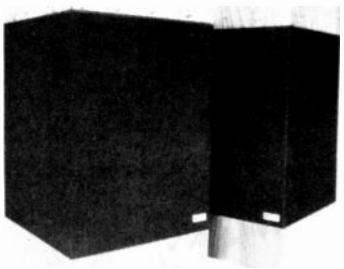
AUDIO SHOWCASE

Model 17 preamp, Model 16a amplifier, and an HK2000 cassette deck. The CRM is equally compatible with other Citation combinations.

New Classic One Speaker

KLH's Classic One is a large bookshelf speaker having a maximum power handling capacity of 60 watts RMS per channel and a minimum power requirement of 15 watts RMS per channel. This medium-efficiency speaker features a 10-inch long-throw high-complicance



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woofer for maximum bass in a two-way system. Its one-inch soft dome LK 10DT tweeter has a horn-like frame assembly for greater efficiency, and the unit is said to produce 180 degree dispersion, highly accurate transient response, and low distortion. There's an infinitely variable rear-mounted control, and you can get the Classic One with an optional removable smoked glass top. A removable wrap-around cloth panel is trimmed with hand-oiled oak veneer molding at the top and bottom. Size: 12 inches wide and deep, 24 inches high. Suggested retail price: $199 each.

Cassette Deck With Bias Adjustor

This new AIWA AD-6400 stereo cassette deck with Dolby is equipped with a bias adjustment knob that enables the user to attain a flatter-than-ever frequency response with any LH/Normal tape, according to the manufacturer. Independent three-position bias and equalization selectors are also featured. Frequency response is put at 20 to 15,000 Hz with HL tape, and 20 to 17,000 Hz with chromium or FeCr tape. Signal-to-noise ratio is 65 dB (Dolby on, FeCr tape) and wow and flutter is rated at 0.05% WRMS. Other notable features: two-step peak level indicators for recording; high-performance Ferrite Guard head for record/

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playback; timer standby mechanism that accepts any high quality audio timer used for absentee recording of broadcast programming; front-mounted DIN jack for one-cord connection to other components without disturbing rear wiring; full auto-stop; quick cue/review tape skip facility; headphone jack. Price: $420.00.

Automatic Direct-Drive Turntable

Dual's newest turntable, Model 621, is a direct-drive unit with automatic start and stop. The unit's tonearm is dynamically balanced and mounted in a four-point gimbal. The counterbalance contains an exclusive Dual feature consisting of two mechanical anti-resonance filters tuned to absorb parasitic resonances originating in the tonearm/cartridge system and chassis. The motor is a DC electronic job, with speed regulated by a CMOS integrated circuit and digital reference circuit. Wow and flutter are rated at less than ±0.03%

Circle No. 27
On Reader Service Card

and rumble is better than 70 dB. Features include a 10% pitch control, illuminated strobe, continuous repeat, cueing damped in both directions, and anti-skating calibrated for all stylus types. Nationally advertised price, including base and cover, is less than $300.

ReVox Digital Tuner

ReVox's new B760 Digital Frequency Synthesizer FM Stereo Tuner, which features a 15-station programmable memory, is claimed to be of entirely new design using a microprocessor for all digital tuning and memory functions. A quartz-referenced digital frequency synthesizer accurate to within 50 parts per million "virtually eliminates drift and is more accurate than the broadcast channel likely to be received." The unit is tunable in increments of 25 kHz over the frequency band from 87 to 108 MHz to cover FM broadcast frequencies world-wide. Front end features include two broadband RF stages followed by six tuned filters and a symmetrical push-pull mixer. Eighteen varicap diodes are used to provide a healthy overload margin for distortion-free performance in high signal strength areas. The front panel LED digital display shows station frequency in five digits. When a channel

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is selected from memory, two additional digits indicate which pre-tuned channel is in use. A 16 x 12-bit CMOS random access memory is used for electronic storage of up to 15 frequently used channels. The memory is non-destructive, keeping its information even in the event of a power failure. Specifications: frequency response, 30 to 15,000 Hz ±1 dB; total harmonic distortion, 0.15% in both mono and stereo modes; signal-to-noise ratio, 75 dB; stereo separation, 42 dB at 1 kHz; sub-carrier suppression, 65 dB; AM suppression, 70 dB. Price: $1,145.

Lowest-Priced Bookshelf Speaker

James B. Lansing Sound (JBL) says this model L50 three-way bookshelf loudspeaker system is, at $276, the lowest-priced unit in the company's line. The L50 employs a 10-inch low frequency driver, a 5-inch midrange driver and a 1.5-inch high frequency radiator, all arranged on a closely-spaced vertical line array. This arrangement is said to provide minimum interference between the drivers in the horizontal plane, thereby creating "outstanding imaging and depth." The drivers are housed in a tuned bass reflex enclosure for excellent bass response with high efficiency, according to JBL. The system employs "one of the most sophisticated crossover networks JBL has ever produced." It incorporates impedance-leveling and phase-correcting circuitry, ensuring that the system operates in a nearly ideal manner through the transition frequencies. The low frequency driver utilizes a 2-inch voice coil, a 2½ lb. magnet assembly ener-

gized by a powerful Alnico V magnet, and a 4-inch diameter center dome. At

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On Reader Service Card

higher frequencies, energy is coupled to the center dome because radiation from the dome's smaller area maintains wide sound dispersion and smooth response far higher than the required operating range of the driver, according to JBL.

New Audio Connectors

New Swiss-made Neutrik audio connectors, now available through Philips Audio Video Systems Corp., feature interchangeable and add-on components, corrosion-resistant contacts, and a patented cable collet-type clamp. The products are intended principally for audio use in three-pin configurations. Connector housings are of a particularly tough alloy of zinc, molybdenum, copper and aluminum. Inserts are made of fiberglass reinforced, high-temperature, hard plastic. The first innovation concerns a one-piece three-pronged and threaded ⅜-inch deep collet clamp made of heat-treated polyolefin plastic which accepts cables from 4.5 to 7 mm in diameter. Because it is serrated at right angle to the inserted cables, the collet firmly grips the cable as the threaded black flexible strain relief

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bushing is hand tightened. The second innovation has to do with interchangeability of components to facilitate assembly of connectors for in-line pads or filters, for balanced-low to balanced-high impedance conversion, and for female connectors with switch. Prices range from $3.55 to $5.65.

(Continued on page 14)


1½" Mylar® dome tweeter for extra-wide 170° high frequency dispersion.
High and mid frequency controls are continuously variable to adjust response to suit any room, program material or individual taste.
Two 3½" midranges with individual tuned isolation chambers.
Low frequency driver with specially treated polyurethane foam suspension for lower distortion, free cone movement, and smoother response.

An inside look at Jensen's Total Energy Response.

You're looking at the heart of one of the most uniformly accurate sound reproducers made today.

Jensen Lifestyle speakers present a faithful reproduction of music, with all its complexities and tonal balances. They accurately distribute this sound throughout your listening room. Which is what Total Energy Response is all about. It's the uniform radiation of sound throughout the entire listening area ...at all frequencies.

Unlike many speakers that require special on-axis listening positions—or others that bounce the sound all over your room—Lifestyle is engineered to deliver a wide spectrum of musical information throughout the listening area. In proper perspective. With all the depth and imaging your source material is capable of. And at real-life volume levels.

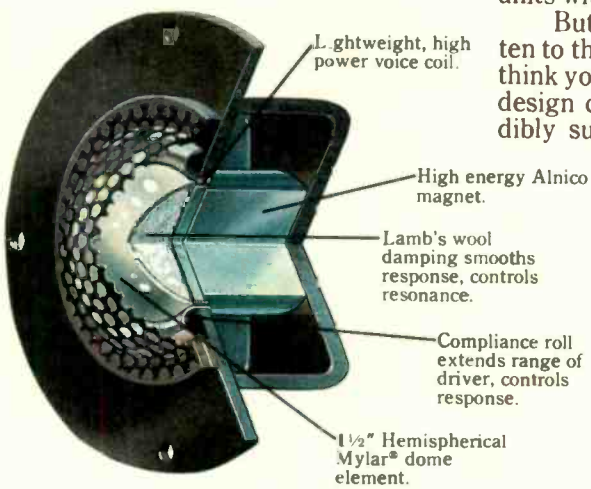
How does Jensen achieve Total Energy Response?

With a series of drivers and crossover components designed for wide dispersion and engineered to work in total unison with each other for proper stereo imaging.

In fact, for perfectly integrated speaker systems and total quality control, we make every element that goes into the manufacture of our Lifestyle speakers. From the heavy duty magnets to our hand-wound, high power voice coils. Even the computer-designed crossover network.

At Jensen we take pride—and extra care—in producing the specially designed Mylar dome tweeters that provide 170° high frequency radiation. The same goes for the polyurethane foam cone suspension woofers. And the critical midrange units with tuned isolation chambers.

But please, give a critical listen to these speakers in person. We think you'll agree, a notably superior design concept has resulted in audibly superior sound reproduction.



The Jensen dome tweeter.
A significant factor in Jensen's Total Energy Response.
High frequency sound waves travel in a straight line. But the rounded shape of this element creates a sound wavefront pattern of the same shape. Thus, as these rounded sound waves travel outward from the dome, they fill the entire listening area.

JENSEN
LIFESTYLE SPEAKER SYSTEMS

Division of Pemcor, Inc.
Schiller Park, Illinois 60176

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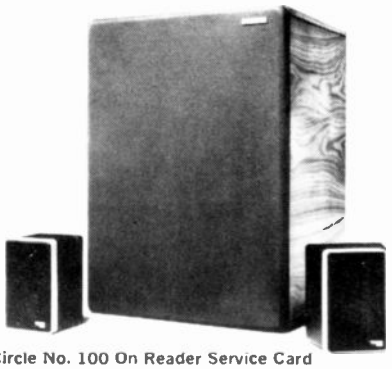
AUDIO SHOWCASE

(Continued from page 11)

Sub-Woofer Speaker System

Visonik's Sub-1 sub-woofer, when mated with two David series D-502 speakers, is claimed to provide a "potent and innovative solution to some difficult sound reproduction problems." By combining a single sub-woofer in a separate enclosure to reproduce the lowest bass tones, with two small speakers that reproduce mid and high frequencies, each part of the audio spectrum is said to receive accurate reproduction "without compromise." Since all sound under 200 Hertz is omnidirectional, the single sub-woofer can be placed or even be "hidden" in any part of the room. Bass reproduction is best when the sub-woofer is at floor level. The Sub-1 features a 12-inch woofer and a matrixing crossover, and no separate amplifier is required. The nominal power handling capacity of the system is 150 watts RMS per channel (DIN 45500) and the recommended amplifier power is from 50 to 300 watts per channel RMS. Frequency response for the system is put at +4/−8 dB from 16 to 30,000 Hz and ±2 dB from 28 to 22,000 Hz. The Sub-1 crossover is at 160 Hz. The suggested retail price for the Sub-1 is $550 in the dark grey/black/silver version and $360 in walnut. List price for each David 502 is $115.



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Dual Monaural Tuner/Preamplifier

Mitsubishi's dual monaural tuner/preamplifier, model DA-C20, carries a suggested retail price of $490. Specifications for the tuner section: S/N ratio (IHF), 80 dB mono and 75 dB stereo; frequency response, 30 to 15,000 Hz ±1 dB; total harmonic distortion at 1 kHz, 0.05% for mono and 0.08% (IHF) for stereo. The AM tuner section has a signal-to-noise ratio of 50 dB, 30 dB selectivity, 40 dB image response ratio (IHF) and image frequency rejection (DIN), and total harmonic distortion of 0.8%. Preamplifier specs: S/N ratio of 84 dB phono and 110 dB tuner (IHF); S/N ratio of 74 dB for the moving coil preamp section;

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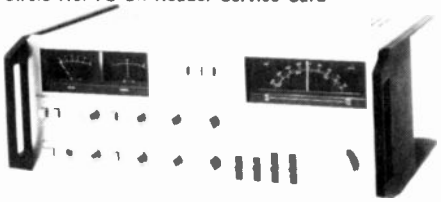

channel separation crosstalk, less than noise level at 1 kHz; frequency response for phono, 20 to 20,000 Hz ±0.2 dB; frequency response for tuner, 10 to 100,000 Hz. Total harmonic distortion for phono is 0.003%, for phono MC 0.005%, and for high level 0.002%. Features include: rotary disc dial with red tuning lock and stereo indicators; signal and tuning meters; tape monitor; tape duplicate function; mode and subsonic filter switches; switchable selectivity; muting/mode and bank selector controls; A plus B speaker and tone controls; left and right channel volume; bass, treble, attenuator and dial selector controls.

Four High-End Acessories

Memorex introduces a new line of high-end record and tape accessories. A Tape Recorder Care Kit, priced at $8.99, provides all necessary tools to clean heads, capstans and guides. Included are a pad and wand, inspection mirror and cleaning brush. The kit can be used with all kinds of tape equipment. A Tracking Record Cleaner ($7.99)

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On Reader Service Card

fits all standard turntables and changers to automatically remove dust from records and reduce static build-up during play. A bottle of specially-formulated cleaning fluid is included. A Stylus Care Kit ($7.99) provides tools needed to measure tone arm tracking force and to inspect the stylus. A built-in magnifier on the gauge does the trick. Cleaning fluid is included. The Deluxe Record Cleaner ($14.99) features a specially-designed and "highly-efficient" brush that applies cleaning fluid to the record, and cleans and dries the surface while reducing static electricity.

Capacitance Loading Device

To ensure proper capacitance matching and optimum performance of Ortofon magnetic cartridges, the company has prepared a special dual capacitor identified as the CAP 210. This unit, in conjunction with the average cable capacity

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On Reader
Service Card

and pre-amplifier's phono input capacity, provides a total capacitance of approximately 400 pF per channel. CAP 210 fits easily over the terminal pins of the cartridge and can be mounted and removed without the use of special tools. The device was designed for use with Ortofon cartridges in the M 20 Super series and the entire Mk II range. If you use Ortofon cartridges, and want to provide the optimum load termination specified by the manufacturer, you can get the CAP 210 for $7.50.

Un-Boxy Speaker

The Avid Corporation has just introduced its new, model 330 speaker system. Avid's philosophy for speaker design is to try to eliminate what they call the "boxy sound"; that is, the sound that is caused by the defractions and refractions of the speaker. Your ears recognize a boxy sound by picking up the early reflections of sound that come far to soon to have been bounced off a concert-hall wall. According to Avid the solution is simple, effective and affordable, and is accomplished by a combination of three techniques. The first is a specially engineered coupling device which has been developed as part of each mid and high frequency driver to transmit the sound waves generated by each driver to and beyond the cabinet/grill face with minimum diffraction effects. Second are the solid front grill panels which perfectly enclose each driver unit preventing

AUDIO SHOWCASE

diffraction effects on the face of the cabinet. Finally the grille panels are radiused off at the edge creating a

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smooth, gradual transition from panel to cabinet sides which virtually eliminate cabinet edge diffraction.

The Avid 330 features a 12-inch air-suspension woofer, a two-inch dome midrange and one-inch dome tweeter. Crossover is at 500 Hz and 6000 Hz and it is reported to have 35 Hz to 20,000 Hz frequency response ± 3 dB; efficiency is 88 dB with a 1-watt input; the minimum recommended power is 15 watts per channel and the maximum power handling capacity is 250 watts continuous. The 330 is finished in walnut veneer, has a dark brown grill and measures 30 inches high, 17 inches wide and 10¼ inches deep. Suggested price $350 each.

Two British Speaker Systems

Tannoy's two new speaker systems are appropriately called the Buckingham and the Windsor. The Buckingham is a three-way system incorporating four

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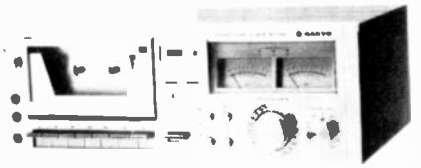
separate transducer assemblies. For 20 to 350 Hz bass response, there are two 12-inch drivers operating in a 6 cubic foot enclosure with a reflex port mass of 25 grams; a 350 to 3500 Hz midrange is provided by a 10-inch driver operating in a 1.1 cu. ft. totally enclosed space; a 3500 to 20,000 Hz treble range is obtained with a horn-loaded compression driver with sealed acoustic cavity and slant plate acoustic lens. A 20-element network provides crossovers at 350 Hz and 3500 Hz, while a separate 10-element control network permits modifying amplitude response. The Buckingham can handle 200 watts continuous integrated program material and 1000 watts peak material. The Windsor, a three-way system incorporating three separate transducer assemblies, can handle 120 watts continuous power input. Drivers: 20 to 350 Hz with a 12-inch unit operating in a 4 cu. ft. enclosure with a reflex port mass of 17 grams; 350 to 3500 Hz midrange by means of a 10-inch driver operating in a 0.9 cu. ft. transmission line enclosure; 3500 to 20,000 Hz treble with a horn-loaded compression driver with sealed rear acoustic cavity and slant plate acoustic lens. A 14-element crossover network (350 and 3500 Hz) and a five-element control network complete with assembly. Prices per speaker: Buckingham, Walnut $2,250, Rosewood $2,500; Windsor, Walnut $1,250, Rosewood $1,450.

Deluxe Cassette Deck

Sanyo Electric's Model RD5350 stereo cassette deck is claimed to offer "some of the most sophisticated features ever offered on a cassette deck." The unit features a special Permaloy recording head and PLL DC servo motor with 34 stator and 34 rotor poles (tachogen-



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erator system). Other features: separate calibrated input output level controls, jumbo lighted VU meters, record mute, standby timer and back-lit cassette light. There's also a full automatic stop, locking pause, separate bias equalization switching, LED peaking indicators, separate left and right microphone jacks, headphone jack and digital tape counter. Frequency response measures up to 17,000 Hz with CrO_2 or FeCr tape, and signal-to-noise ratio measures 64 dB with Dolby on. Simulated walnut covered metal cabinet. Suggested list price: $199.95.

Fuji FX Cassette Tapes

The Magnetic Tape Division of Fuji Photo Film USA claims outstanding performance for two newly-formulated FX-I and FX-II cassette tapes. By precisely optimizing particle size of the Ferrix "pure gamma hematite formulation," the binder, the base film, and the coating process, a normal bias, 120 microsecond equalization tape is claimed to have been achieved. The Fuji FX-II formulation is a Berthollide iron oxide (tradenamed Beridox by Fuji) which is described as a compound that

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lies "between" the common iron oxides, hematite and magnetite. The in-between compound is said to "exhibit all the good characteristics of each (oxide) material while eliminating all the negative characteristics." The FX-II line of high-bias, 70 microsecond equalized audio cassettes is "for the audiophile seeking the ultimate in fidelity." The FX-II tape is claimed to give an increased Maximum Output Level (MOL) of +4 dB, substantially improved high and low frequency response, and a significantly improved signal-to-noise ratio of 61 dB. Retail prices: FX-I C-90, $6.15; C-60, $4.50; C-46, $3.90; FX-II C-90; $6.15; C-60, $4.60; C-46, $4.10.

Precision Preamplifier

DB Systems claims that this DB-1 Precision Amplifier has "the lowest distortion and most accurate phono equalization of any preamp on the market." Total harmonic distortion is said to be less than 0.0008% across the audio band, and the RIAA equalization is within 0.15 dB from 10 to 20,000 Hz and within 0.07 dB between 20 and 10,000 Hz. The preamp is designed to work into a load impedance of 10,000 ohms or greater with a maximum of 3,000 picofarads capacitance. Maximum output voltage into the rated load

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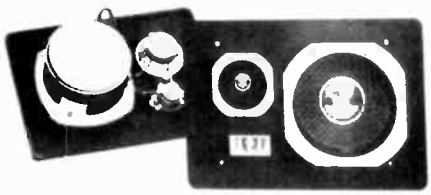
is 6 volts. The phono inputs have a signal-to-noise ratio of 89 dB when shorted and 83 dB when used with a typical cartridge. The simple front panel layout includes: knob controls for volume, balance and input selection of phono, tuner, tape and two auxiliary sources. There's also a toggle switch for tape monitoring, and for high- and low-frequency filters. The preamp contains only the audio circuits, so an external power supply must be used. The unit is designed to be left on constantly so there is no power switch (it's said to draw negligible AC line power). Another unusual feature: a buffered tape-output which eliminates the possibility of adverse loading of the signal-carrying circuits by a tape machine. Prices: the DB-1, $397; DB systems power supply, $78; solid walnut cabinet for the preamp, about $35.

"No Frills" Car Stereo Set

Sparkomatic says this "no frills" three-speaker car stereo set was designed to fit 6-by-9-inch cutouts for rear deck installation. The new model SK-6900 is equipped with separate 5¼-inch foam edge air suspension woofers with 20-ounce ceramic magnets, 3-inch foam edge air suspension midrange speakers and dome-horn loaded tweeters. The set is claimed to reproduce a full sound



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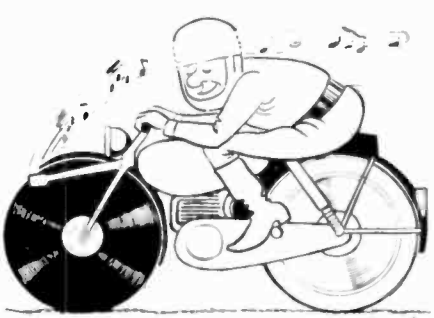
range from the lowest bass response through the mellowest mid tones to the highest of treble frequencies. The "quality equipment" look is enhanced by use of formed heavy gauge wire mesh grilles and chrome speaker "gaskets." The speakers are compatible with all 4 and 8 ohm tape players and radios. Price: $74.99. ▲



JAZZ

Bill Evans/by Gary Giddins

☐ The news that Eddie Gomez had recently left the Bill Evans trio, after 12 years, prompted a feeling of relief in this corner, not because they no longer worked well together (*Montreux III* shows they did, at least on occasion), but because they had grown too comfortable, like a married couple with nothing to say over breakfast. Sameness had crept in: Evans began too many pieces with a brisk statement of the theme followed immediately by a heavy-breathing bass solo that usually opened with a leaping arpeggio from the middle register. In place of the three-way improvising that has always been Evans's ambition—and frequently his achievement—there was familiar counterpoint, brilliance turned to brilliantine.

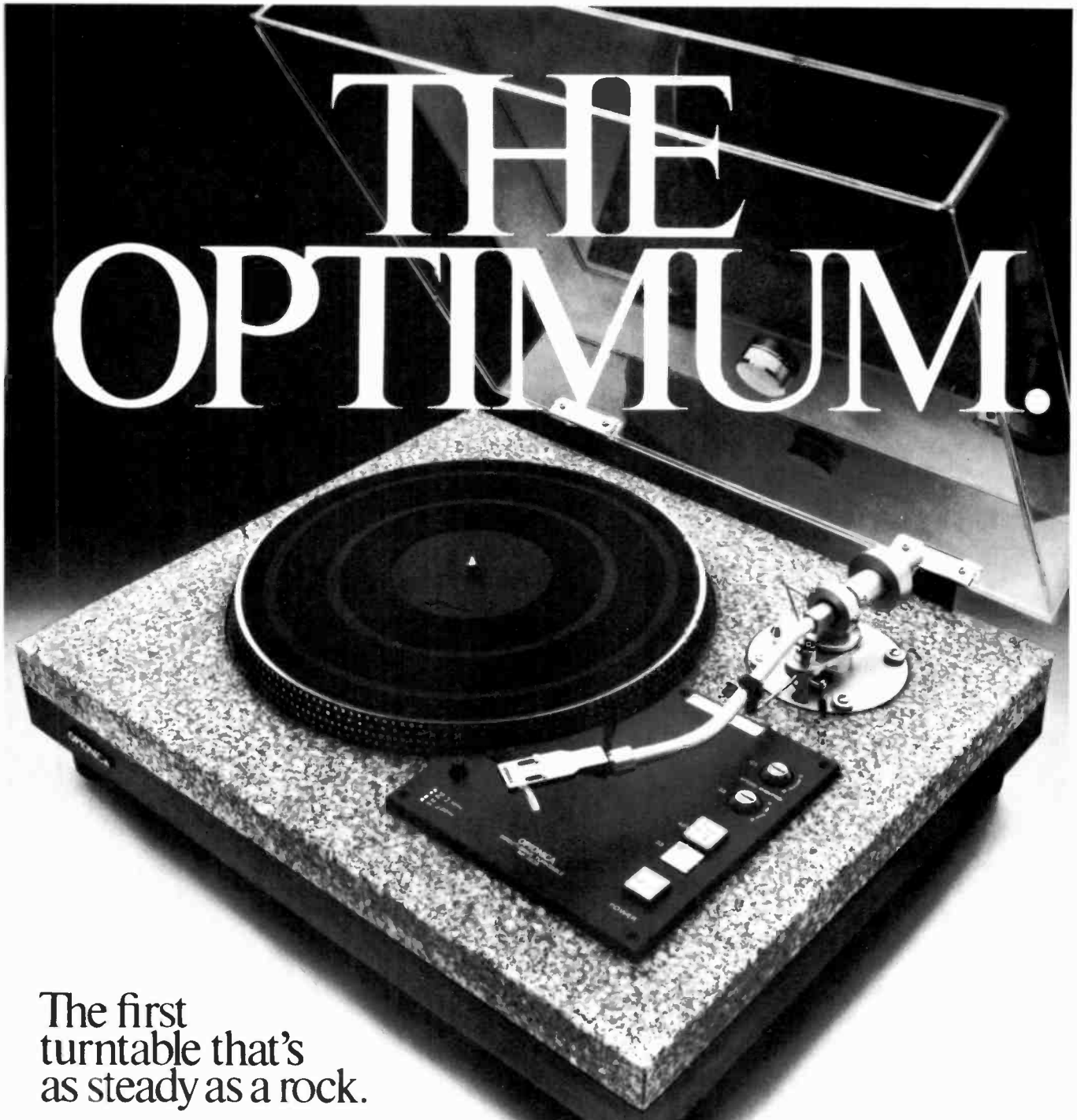
Gomez joined the trio in 1966, shortly after Evans's memorable Town Hall concert, which had followed a long impasse when the pianist compensated for the absence of a first-rate band by conversing with himself and studio guests; Gomez's grainy, aggressive sound (objectionable at times in his bowing) underscored the change in Evans's music from the spare introspection of the early '60s (when Scot LaFaro was the bassist) to an accessible medium lush and medium tempo lyricism. An abiding problem in subsequent years was his choice of drummers. The mystery of how a musician of Evans's harmonic ingenuity, dynamic skill, and taste for melodic nuance could tolerate the impressionistic clangor of Marty Morrell or the ennui of Elliot Zigmund was intensified by the fact that had previously employed three of the finest drummers available, Philly Joe Jones, Paul Motian, and Jack DeJohnette.

Evans's two current Fantasy albums suggest a discontent with the recently disbanded trio: *Quintessence* is a quintet session, and *Alone (Again)*, recorded more than two years before its release, is his first solo recital since 1968. Moreover, he now has a new trio which is cause for optimism, if not celebration. Philly Joe Jones is back on drums, after nearly 20 years, and the excellent Michael Moore is on bass. It has long been Evans's habit to solidify his trios in public performance in order to stimulate spontaneity, and we can expect to hear this trio coming into its own for some time. In jazz, process is often more absorbing than the finished product.

Moore has a warm, poker-faced tone and an easy sense of time that combines LaFaro's restless melodicism with the tonal and

(Continued on page 77)

Gary Giddins writes on jazz regularly for the Village Voice and New York. His criticism has appeared in a wide variety of publications and has twice won the ASCAP-Deems Taylor award for music criticism. He is at work on books for Dial and Oxford University Press.



The first turntable that's as steady as a rock.

Turntables shouldn't cause howling and screeching through the night. But that's exactly what happens, thanks to mechanical and acoustic feedback caused by loudspeakers vibrating an insecure turntable.

Since most turntable bases have been made of laminated plywood, beech, die-casting or plastic, howling has been a problem that just wouldn't go away.

Until today, that is.

Announcing the Optonica RP-3636 Direct Drive Turntable.

We built the ideal turntable, literally as solid as a rock because it's built on 15.8 pounds of Mikage granite stone. Which means that vibrations from the speakers are absorbed, reducing acoustical feedback and maintaining maximum signal to noise ratio.

The Optonica RP-3636 also features a highly sensitive S-shaped tonearm. Which means that the stylus will pick up subtle sound signals as accurately as the cutter stylus that recorded them. And an oil-damped cueing control that gently lifts and lowers the tonearm so your records will be protected from damage.

We invite you to test the Optimum turntable at one of the select audio dealers now carrying the full line of Optonica stereo components. Call toll-free 800-447-4700 day or night (in Illinois dial 1-800-322-4400) for the name and address of your nearest Optonica showroom, where you can see the complete Optonica line and pick up your free copy of our catalog. Or for further information, write Optonica, Dept. SBG, 10 Keystone Place, Paramus, New Jersey 07652.

From our unique turntable built as steady as a rock to our cassette deck that automatically finds your selections, throughout Europe and Japan, Optonica is one of the fastest selling lines of stereo components on the market today.

OPTONICA THE OPTIMUM.

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SOUND PROBE

More than any other component, the loudspeakers in your stereo system determine what you hear. They, after all, produce the actual sound. In a sense, they are musical instruments—but instruments of an extraordinary kind, alternately or simultaneously sounding off as violins, trumpets, drums or flutes, or whatever musical fare is fed to them in the form of electric signals.

Given the complexity of their task, it is hardly surprising that speakers represent the trickiest area of audio design, and technical specifications alone cannot fully describe their performance. That is why the evaluation of speakers must ultimately be based on listening rather than on measurements.

When the editor of HFSBG asked me to do such listening tests, I didn't want to rely on my own judgment alone. So these reports represent the joint opinion of myself and Christopher Greenleaf, who as a restorer of pipe organs, rebuilder of pianos, and occasional recording engineer has a pair of unforgiving ears.

As for my own qualifications, they consist partly of whatever electronics I managed to pick up in the U.S. Air Force, and about twenty years of intensive professional involvement in audio. But most of all, I rely on what I've learned about the real sound of music in half a lifetime of haunting the concert halls and jazz joints of America and Europe. I just hope that whatever critical judgment I can muster will help you find a speaker you can live with happily ever after.

—by CHRISTOPHER GREENLEAF and HANS FANTEL

Acoustic Research AR-18

Description

Its diminutive size—a mere 16½ x 9¾ inches in height and width and only 6¼ inches in depth—makes the AR-18 a true bookshelf speaker, and its weight of 13½ lbs. should not put too much of a strain on a sturdy shelf. The handsome little cabinet contains an 8-inch acoustic suspension woofer paired with a 1¼-inch ring-radiating tweeter, crossed over at 2000 Hz. Overall frequency response claimed in the specifications extends from 48 to 25,000 Hz. Nominal impedance is 8 ohms. Price: $65.

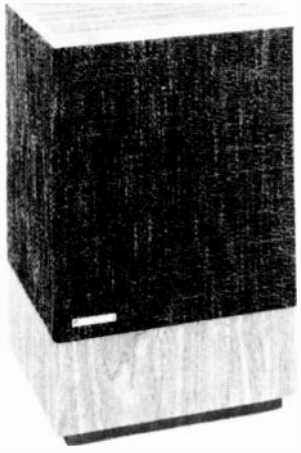
Performance

For an exceptionally small speaker, the AR-18 puts out exceptional sound. Close your eyes and you won't believe it all comes from such a little box. We're speaking relatively, of course, and won't pretend that the lowest pedal notes of a pipe organ will roll out in massive grandeur from this bantam. The bottom starts tapering off around 60 Hz, so you won't be able to shake the rafters with throbbing thunder. But the overall sound is nicely balanced and musically pleasing.

Thanks to a strictly no-skimp design policy within the limits of its size, this speaker keeps the bass honest. No false bottom to make the bass seem bigger than it is. No boom, and—to our surprised ears—not much frequency-doubling either. This allows you to turn up the bass control on your amplifier without instantly turning the music into

(Continued on page 22)

Bose Model 501



Description

The Bose 501 is a square, floor-standing column, finished in walnut-grain vinyl, 24 inches high and 14½ inches in width and depth. Its driver complement consists of a 10-inch acoustic suspension woofer with a long-throw 1½-inch diameter voice coil and a 16-ounce magnet, crossed over at 1500 Hz to two 3-inch tweeters extending frequency response to beyond 15,000 Hz. The dark brown, richly textured grille cloth extends to the sides of the cabinet to permit multi-directional sound projection (to be discussed later). The speaker weighs 42 lbs., has a nominal impedance of 4 ohms, and is priced at $185.

Performance

The Bose Corporation consistently espouses the principle of combined direct/indirect sound projection pioneered by its founder, Dr. Amar Bose, a professor of electrical engineering at the Massachusetts Institute of Technology. This theory takes account of the fact that at an actual concert performance more than 80 percent of the total sound energy reaches the ear indirectly by way of wall reflections—like a carom shot bouncing off the edge of the pool table before hitting the pocket. To duplicate this pattern realistically in the living room, Bose feels that a speaker should radiate part of its sound output *away* from the listener, aiming

(Continued on page 22)

The world's finest audiophile recorder has become even finer

With its large professional VU meters using LED peak overload indicators, its full electronic logic control of tape motion and its precision tape cutter and splicer, the new B77 stereo tape recorder sets new standards of convenience for the discriminating recordist.

Add to this the legendary ReVox superiority in audible sound quality and you have the finest audiophile recorder in the world at a price that will pleasantly surprise you.

Willi Studer wouldn't have it any other way.

To learn more about the even finer ReVox B77, write to us for complete information and the address of your nearest demonstrating ReVox dealer.

STUDER REVOX

Studer Revox America, Inc., 1819 Broadway, Nashville, Tennessee 37203 / (615) 329-9576 • In Canada: Studer Revox Canada, Ltd. / (416) 423-2831

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SOUND PROBE

(Continued from page 21)

Acoustic Research AR-18

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mud. The sound stays clean even when the bass is pushed a bit. In fact, we recommend running this speaker with a moderate amount of bass boost—say, with the control in the 2-o'clock position. The AR-18, grateful for a little help from the amplifier, then puts a firm foundation under the music. That bass fiddle may not come across dramatically, bigger-than-life; but you'll certainly know it's there. More importantly, you'll get the exact pitch—not just a thud. This contributes a lot to the overall clarity of musical texture—whether it's the plucked bass of a jazz combo, the electric bass of a rock group, or the sustained bass line of a symphony.

We discovered that the AR-18 audibly benefits from corner placement. The converging walls act as a kind of horn for the low frequencies, helping the speaker push out more bass.

We've been talking a lot about low-range performance because that's the usual bottleneck in small speakers, and we were impressed by how well the AR-18 gets around these difficulties. But it is equally gratifying up on top. The highs come off clear and crisp, and they spread around nicely so you get good stereo imaging and a feeling of spaciousness. Even so, the sound seems somewhat brighter if you're right on-axis. Orchestral strings sing out warmly without any stridency—an indication of peak-free treble. Trumpets sound like real brass—not tin—and the percussion really hits you. In short, a good tweeter.

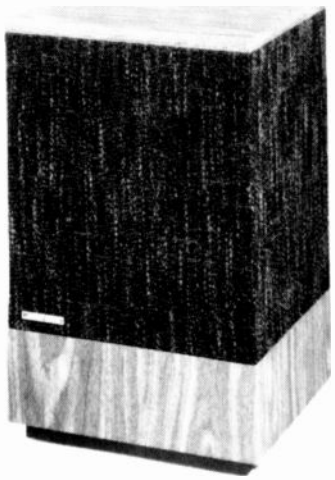
But there's something pretty special about this one. It's liquid-cooled. That's a fairly recent innovation which is now used by several manufacturers—so let's talk about that for a while.

Like any mechanism converting energy into motion, loudspeakers generate heat as a by-product. At normal volume levels, this heat is negligible. But some rock fans pile so much wattage on the voice coil that the incidental heat generated within the tweeter ceases to be incidental. As a result, the voice coil becomes thermally deformed and, in extreme cases, speakers literally burn out at temperatures sufficient to fry eggs.

To provide cooling for the overheated parts, some audio designers now immerse tweeter voice coils in a newly developed magnetic fluid which is far more thermally conductive than the formerly air-filled magnet gap. In consequence, heat build-up in the coil is more quickly dissipated and temperatures are more likely to stay at levels

(Continued on page 76)

Bose Model 501



Circle No. 66 On Reader Service Card

Equipment used in our listening sessions:
Sony STR-5800 stereo receiver,
Philips 212 turntable,
Pickering XSV 3000 phono pickup.

toward the walls. As the sound hits the walls, it reflects as from a mirror, playing very pleasant tricks on your ears.

You may have noticed that when you look in a mirror, your reflection appears *behind* the glass, creating an illusion of spatial depth. Similarly, sound reflected from a wall seems to be coming from behind the wall. So, as you listen, the walls seem to be receding and the sound becomes more spacious than you would hear it from a conventional speaker in exclusively forward (direct) projection. The net effect is an impression of sitting in a large concert hall even when listening in a small room.

This can be very impressive for orchestral music, where you want the added sense of space. Some listeners however, consider it less suitable with vocalists or small jazz groups, where hey want a more intimate kind of ound "imaging." The Bose 501 there-ore features a special device, rather ryptically called a "Direct Energy Control," to let you change the apparent ambience by varying the ratio between direct and reflected sound. This is done by means of a knob recessed into the top of the cabinet which rotates one of the tweeters through an angle of 90 degrees, from facing straight forward toward the listener to facing straight sideways. In this way, the pattern of sound reflections in the upper range (where it really counts) can be altered to suit the requirements of the music, the listener's preference, and the acoustics of the particular room.

Because the swiveling tweeter must be located at the cabinet edge facing the nearest side wall, the two speakers in a pair of Bose 501s are not identical. The left speaker has its swivel tweeter on the left side, the right speaker at the right, and they must be set up accordingly. They also need an unobstructed sound path between the speaker and the nearest side wall, with no interference from furniture. Furthermore, the speakers must be placed at a minimum distance of two feet—preferably more—from the side walls to get a sonic mirror image of sufficient depth. (Remember, the distance of the apparent sound source behind the wall will increase with the distance of the actual speaker from the source of reflection).

Unlike the more elaborate multi-directional Bose designs (notably the Bose 901 Series III and the Model 601), the 501 does not project sound

(Continued on page 76)

Yes, the new Dual 604 is direct drive. Now let's talk about something really important.

You may have noticed that most turntable stories begin and end with the drive system. The tonearm is more or less an afterthought.

But not with Dual. Because the tonearm can make a big difference in how records sound and how long they last. Which is why Dual is very serious about tonearm design and performance. And why we can be very serious about tonearms in our advertising.

Let's consider the 604 tonearm.

The straight-line tubular design provides maximum rigidity with minimum mass. The four-point gimbal centers and pivots the tonearm precisely where the vertical and horizontal axes intersect. And the counterbalance houses two specially-tuned anti-resonance filters that absorb parasitic resonances originating in the tonearm/cartridge system and chassis.

Operation is semi-automatic, with another unique Dual difference: the mechanical sensor. Switch it in and you feel when the stylus is positioned precisely over the 12" and 7" lead-in grooves. At the end of play, the tonearm lifts and returns to its post, and the motor shuts off. Automatically.

Now let's talk about the drive system. It employs a newly developed DC electronic motor with a highly sensitive CMOS regulator circuit and integral frequency generator. Platter speed is checked against rated speed 120 times per revolution. Wow and flutter are less than 0.03 percent, rumble is better than 70 dB. Well beyond the limits of audibility.

But the important story with any turntable is simply this. The drive system merely turns the record. It's the tonearm that plays it.

Dual 604, semi-automatic, less than $260. Dual 621, fully automatic plus continuous repeat, less than $300. Both with base and cover. Actual resale prices are determined individually and at the sole discretion of authorized Dual dealers.

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Circle No. 27 On Reader Service Card

pop discs

A review of the latest popular music releases

by KEN IRSAY

Steely Dan: "Aja." ABC AA-1006. $7.98.

Steely Dan has always been a hard group to pin down. Inaccessibility is a successful part of their mystique. They began in 1972 as a fairly ordinary rock sextet. As the years passed, only two members of the group, Walter Becker and Donald Fagen, seemed to be regulars. Session men came and went to fill out each album. The music was difficult to grab hold of. Dark, mysterious, boring. All of these descriptions have been applied. Now, finally, Becker and Fagen seem to have lifted the curtain. The session men, great ones, are still there but the music is more uplifting, bouncy and optimistic than ever before.

"Peg" and "Josie" come closest to outright commerciality. "Black Cow" ambles along with a nifty jazz beat, bass mixed up front, electric piano and clarinet supporting. Tom Scott solos on sax. The instrumental parts almost seem to be improvised; it's that loose.

Jackson Browne: "Running on Empty." Asylum 6E-113. $7.98.

A few things about this collection make it unique among popular albums. It is, to my knowledge, the first live album comprised entirely of songs previously unrecorded by the artist. It is also a concept album about a pop star's life on the road. Not an unfamiliar subject of course, but the fact that it was recorded on the road (in one case literally . . . on a bus) lends an even greater air of authenticity. Technically, the album is superb. It's easy to forget that the recording wasn't done under tightly controlled studio conditions. Three tunes were done in hotel rooms, the remainder (except for

the bus) in front of audiences. Lyrically, the themes touch on exhaustion, groupies, drugs and fans. There's even one about the road crew who sets up the stage and takes care of the routine logistics of a tour. Troubadour Browne is at his versatile best. The title tune is pounding rock, while "Rosie" sweetly laments the sad fortunes of an ill-fated groupie. Browne is backed by one of the most talented instrumental units on the rock scene, the Section (Russ Kunkel, drums; Leland Sklar, bass; Craig Doerge, keyboards; Danny Kortchmar, guitar). Also featured is longtime Browne accompanist, David Lindley on fiddle and lap steel guitar.

Steeleye Span: "Storm Force Ten." Chrysalis CHR 1151. $7.98.

From the opening bars of "Awake, Awake" you know that this is no ordinary pop or rock album. Steeleye Span is perhaps the most consistently well-received exponent of "Olde English" folk music. They've added a back beat and a bit of rock instrumentation but the basic sound is unmistakably "olde,"

with accordion the featured instrument. The group has a strong vocal sound, as evidenced on "Sweep, Chimney Sweep," an a cappella number that alternates harmonies with brief solo passages. Word is that the group disbanded earlier this year, making this their final effort toward introducing traditional English music to modern audiences in a modern form.

Ronnie Montrose: "Open Fire." Warner Bros. BSK-3134. $7.98.

What Ho! A totally instrumental album that is neither disco nor movie soundtrack. It is indeed a breath of fresh air in the pop field. Ronnie Montrose used to front a heavy metal rock band named Montrose. Apparently he found that format rather restrictive in terms of his guitar playing, so he's changed direction a bit. Montrose describes this album's nine cuts as rock-guitar songs that show off the instrument's capabilities more effectively than the hard rock band format. Assisting with some of the composing and instrumental chores is Edgar Winter, who contributes Moog, piano and harpsichord. In the title cut, Montrose indicates that he has not abandoned hard

rock completely. The tune features a simple, repetitive riff with solid bass lines and some nimble fingered axe playing. A percussion break by Rick Shlosser is effective. Edgar Winter plays a Moog sequencer bass and Montrose displays his mandolin dexterity in "Mandolina." Again the riffs are simple and repetitive with the Moog drawing most of our attention. Ronnie makes his guitar sing on "Town Without Pity," the Gene Pitney classic, and strings and horns provide background drama. ▲

It's hard to find a $1,000 tape deck that doesn't use Maxell. Or a $100 tape deck that shouldn't.

If you spent $1000 on a tape deck, you'd be concerned with hearing every bit of sound it could produce.

That's why owners of the world's best tape decks use Maxell more than any other brand.

But if you're like most people, you don't own the best tape deck in the world and you're probably not using Maxell. And chances are, you're not hearing every bit of sound your tape deck is capable of producing.

Whatever you spent for your tape deck, it's a waste not to get the most out of it. So spend a little more and buy Maxell.

Maxell. You can think of us as expensive tape. Or the cheapest way in the world to get a better sounding system.

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Circle No. 29 On Reader Service Card

Meet the AKG "Naturalists"

AKG designs headphones to simulate the *"Natural"* sound you enjoy from the best seat in a concert hall.

Based on extensive research into the nature of human hearing, AKG developed the K-240—the first headphone to permit the listener to hear sound nearly indistinguishable from a live concert or recorded sound through loudspeakers. That is, with the stereo image in front of him, and with natural, unexaggerated stereo separation and depth perception.

The K-140, a bio-acoustically engineered high fidelity headphone, was created for total sound-comfort correlation with superb bass, transparent music reproduction and uncomplicated ease of use.

The K-40, an economical version of the K-140, is designed to comfortably adapt to the individual ear configuration and define the open resonant space required for optimum performance.

If you haven't found headphones that give you exactly what you want, audition one of the AKG *"Naturalists."* You'll discover beautiful sound in your price range.

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JULY/AUGUST 1978

SPEAKER SPECIFICATIONS

by WILLIAM S. GORDON

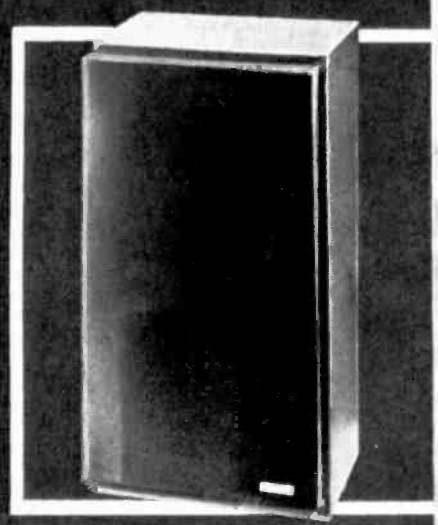
WHAT THEY CAN AND CAN'T TELL YOU ABOUT THE WAY A SPEAKER WILL SOUND

So you want to know about speaker specs. A most enigmatic subject to say the least. Inscrutable. It doesn't appear that way on the surface, but really it is. As with most other high-fidelity equipment, speakers carry specifications. Now, the specs on even a simple amplifier can be difficult to interpret. Different reference levels are used by different manufacturers, and that makes comparing specifications—especially signal-to-noise ratio and sensitivity—a can of worms. But at least some standards do exist, and there is *some* uniformity to the game.

In general, speaker-measurement standards *don't* exist so it's a free-for-all. Actually, there is a quasi-standard method of specifying impedance, but you'd never know it if you compared the typical manufacturer's spec with an actual measurement made according to the standard. Little loss. An impedance measurement made on a typical multi-way speaker system—in accordance with the "standard"—seldom yields truly useful results. Let's take a look at the specs of a typical loudspeaker and see what they *can* mean, what they *don't* mean, and (with luck) how you can tell the difference.

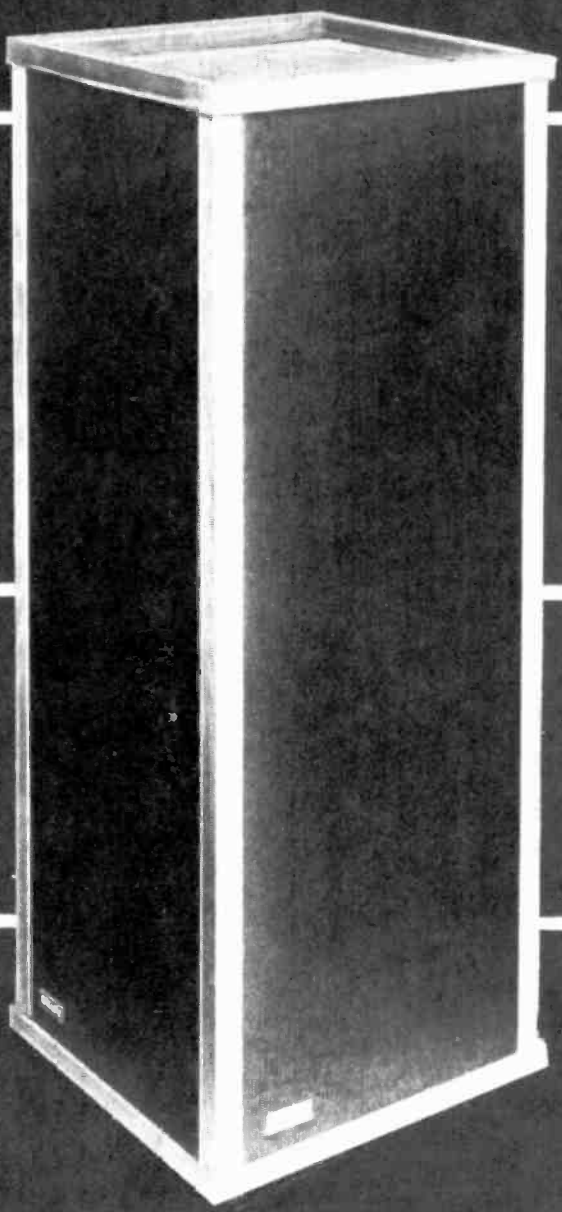
Impedance. A loudspeaker's impedance rating tells you the load it presents to the power amplifier. It is a measure of the speaker's opposition to the flow of current. The greater the impedance is, the less current will flow through it for a given applied voltage. Thus, the greater the impedance, the less power it accepts from the amplifier at a given output-voltage level.

There are three common loudspeaker impedance ratings—4 ohms, 8 ohms, and 16 ohms (although few modern high-fidelity loudspeaker systems purport to be 16-ohm devices). Tube amplifiers almost always used an output transformer which was tapped to match

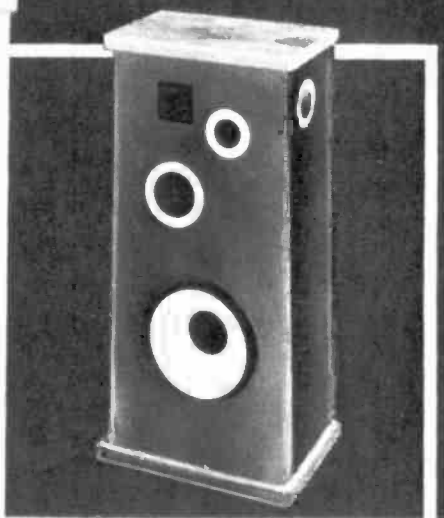


Ultralinear's ST525 has aligned drivers and individual level adjustments for bass, midrange, and high frequencies. $380 or $420 depending on the finish you choose. Circle No. 140.

The Martin Gamma 310 incorporates a 10-inch woofer, a 5-inch convex midrange, and a 3-inch compression horn tweeter. Nominal impedance is 8 ohms. $190. Circle Number 111.

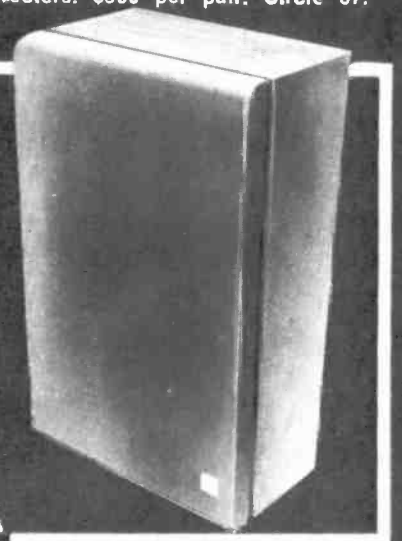


Epicure's Model 400+ includes a tweeter level control, four air-spring tweeters, and four woofers. 38 inches high, its price is $800 per pair. Circle No. 68.



Synergistics Model 62A sells for about $400. Included are a 12-inch woofer, a 4½-inch midrange, 3 2½-in. tweeters, and one Piezo electric super tweeter. Circle Number 139.

The Interface: A Series II speaker from Electro-Voice has four drivers: a 12-in. low frequency radiator, an 8-in. midrange/woofer and two 2½-in. tweeters. $500 per pair. Circle 67.



SPEAKER SPECS

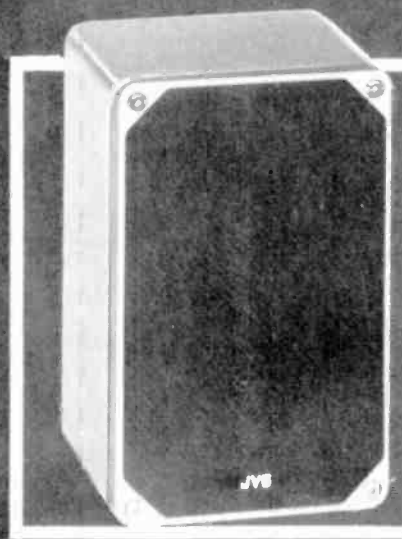
4-, 8-, or 16-ohm speakers. The few tube amplifiers currently on the market also use output transformers. So does at least one transistor amplifier.

When an output transformer is used, the particular impedance rating of a loudspeaker is not too important provided that it mates with one of the taps on the transformer. As long as a match is achieved, the amplifier "sees" the load with which it was designed to operate, and it will gladly deliver its rated power when called upon to do so. The loudspeaker's impedance becomes a more important consideration when no transformer is used—and that is precisely the case with the vast majority of present-day amplifiers.

A typical power amplifier is essentially a constant-voltage source. That is, within its capabilities, it supplies an output voltage proportional to the input voltage. (Note that we said output *voltage*, not output *power*.) The actual power available to the loudspeaker depends upon its impedance. It is greater for a low-impedance loudspeaker than for a high-impedance one. Thus, the 100-watt amplifier you just bought will indeed supply 100 watts into its *rated* load (typically 8 ohms). More power will probably be available into a 4-ohm speaker; less into a 16-ohm speaker.

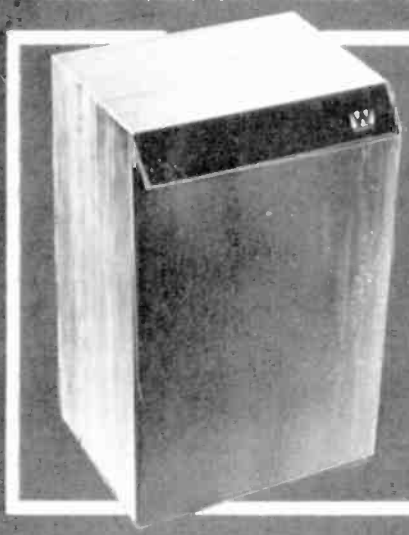
It would seem then that the loudspeaker impedance should be as low as possible. Not without limit, however. As the load impedance gets lower, the current the amplifier is required to supply (at a given output voltage) increases. There is a practical upper limit to how much current can be pumped out without exhausting the amplifier's power supply capacity and/or overheating (and destroying) the output transistors.

To prevent the latter possibility, most power amps have protective circuitry that monitors the output current and voltage, and dynamically shuts down the amplifier if danger lurks. Although the amplifier's distortion is usually



JVC's S-M3 two-way acoustic suspension speaker measures 7⅝ x 4½ x 4½ in. and includes a 4-inch woofer and a 1-in. soft dome tweeter. $159.90 pr. Circle Reader Service Number 74.

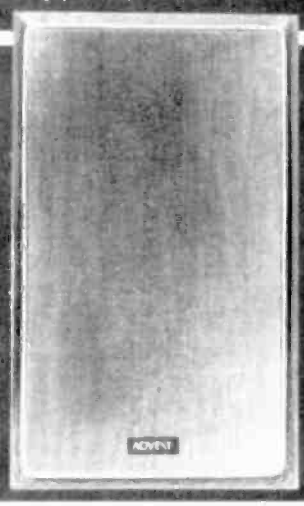
The Wharfedale speaker line includes a 3-way reflex system called the Dovedale. It employs two 7-inch woofers, a 4-inch midrange, an isodynamic tweeter. $355. Circle Number 141.



B.I.C.'s Formula 7 Spec II is a 4-way loudspeaker which includes a sound pressure level readout feature. $485. Circle Reader Service Number 65.

Altec's Stonehenge II is a vented speaker which uses a high-compliance woofer, a cone-type midrange, and a cone-frame radiator for high frequency reproduction. $359. No. 64.

The Advent/1 is a 2-way speaker system comprised of a 1⅛-inch cone tweeter with ferro-fluid damping and a 10-inch woofer. Price: $100, walnut-look vinyl; $120, walnut veneer.

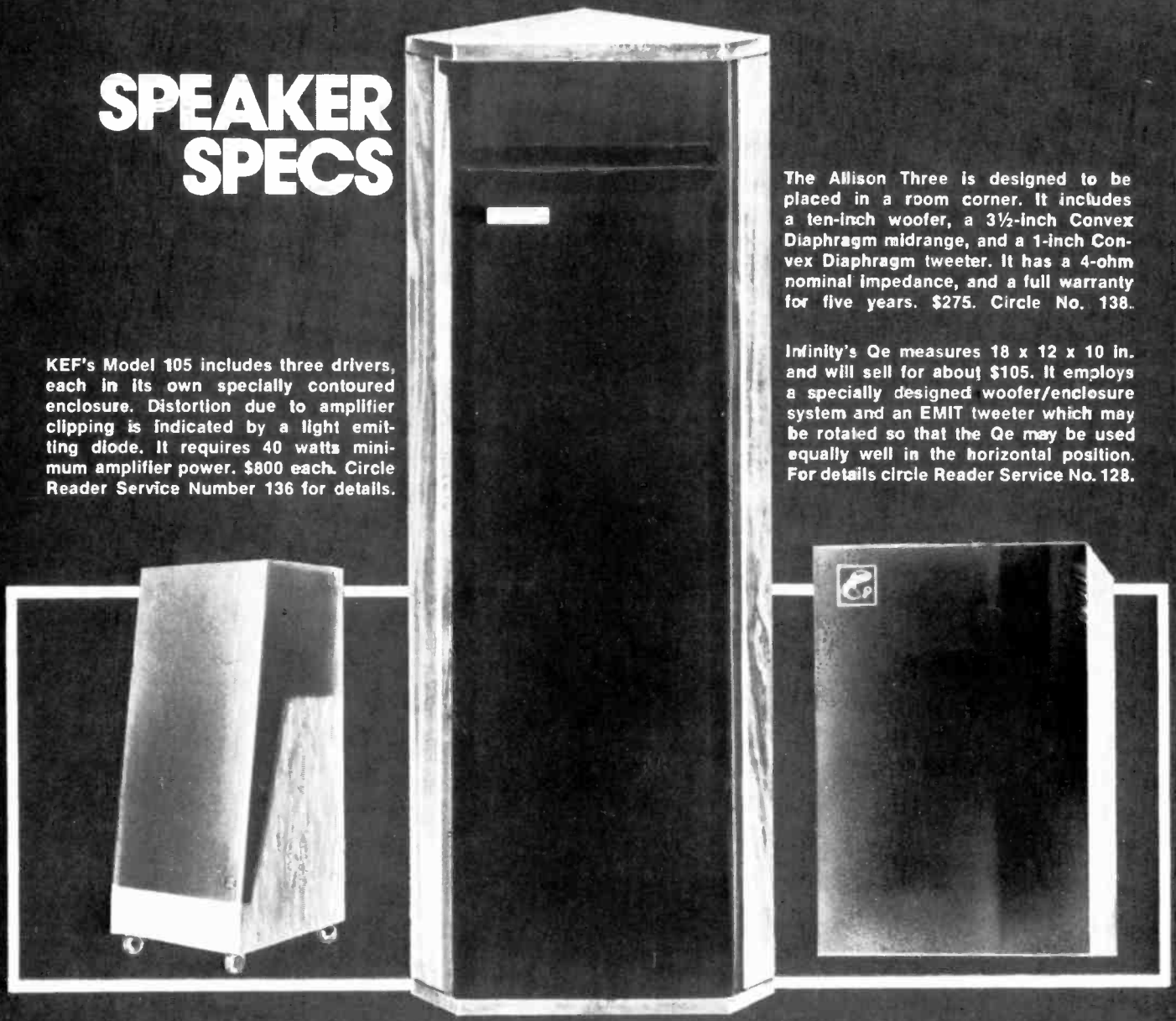


greater when operating into a lower impedance than into a higher one, as soon as the protective circuitry triggers, the distortion can really be horrendous. (Furthermore, in protecting themselves, amplifiers have been known to destroy a speaker's tweeter. Large amounts of high-frequency energy can be sent to the speaker as the amplifier abruptly closes up shop.) The minimum safe load on an amplifier is usually specified by its manufacturer. Four-ohms is the most common figure, but some amps will safely drive a 2-ohm load.

The average amplifier is therefore capable of driving the average speaker —not surprising. However, the typical amplifier has provision for *two* sets of loudspeakers—occasionally three sets. When you switch to "A+B," the two sets of speakers are connected to the amplifier in parallel. The load impedance is now much lower. If the speakers are identical the net load impedance is half that of either one. If the speakers have different impedances, you can calculate the net impedance by multiplying the two impedances together and dividing the product by the *sum* of the two impedances. If you intend to use two sets of loudspeakers simultaneously with an amplifier capable of a 4-ohm minimum load, each of the speakers should have an impedance of 8 ohms or greater.

So far, so good. The nasty part of the story is that the impedance rating of the average loudspeaker seldom tells the whole story. The actual impedance is not constant but varies with frequency. In the low-frequency region, it hits a maximum at the speaker resonance. (Vented speakers usually show two low-frequency maxima with a trough in between.) Above the resonant frequency, the impedance dips to a relative minimum value and, farther up the spectrum, it starts to rise again. The quasi-standard point at which to "rate" impedance is at the minimum value just above the resonance. How-

SPEAKER SPECS



KEF's Model 105 includes three drivers, each in its own specially contoured enclosure. Distortion due to amplifier clipping is indicated by a light emitting diode. It requires 40 watts minimum amplifier power. $800 each. Circle Reader Service Number 136 for details.

The Allison Three is designed to be placed in a room corner. It includes a ten-inch woofer, a 3½-inch Convex Diaphragm midrange, and a 1-inch Convex Diaphragm tweeter. It has a 4-ohm nominal impedance, and a full warranty for five years. $275. Circle No. 138.

Infinity's Qe measures 18 x 12 x 10 in. and will sell for about $105. It employs a specially designed woofer/enclosure system and an EMIT tweeter which may be rotated so that the Qe may be used equally well in the horizontal position. For details circle Reader Service No. 128.

ever, everyone doesn't do it that way.

Most loudspeaker systems are either two-way or three-way and include tweeter and/or midrange drivers and crossover networks. As the midrange comes into play, the impedance curve again starts to fall. It usually rises again and then dips down as the tweeter comes on. At the very highest frequencies, the curve may slope upward, flatten out, or even keep on falling—depending upon the design. Furthermore, the impedance at the middle and upper frequencies usually depends upon the setting of the midrange and tweeter level controls.

The impedance curve of the average loudspeaker is so irregular that to say it has this or that particular impedance is the height of oversimplification. A range of 4 to 1 in impedance is par for the course. A 10-to-1 range is not unheard of. Evidently, many speaker manufacturers specify some sort of an average impedance. An "8-ohm" loudspeaker may exhibit an impedance of only 4 ohms at some frequencies while exhibiting 25 ohms at others.

Does this mean that the speaker draws more power at some frequencies than at others? Yes, it does. Does this mean that the speaker will emphasize that part of the spectrum? Not necessarily. A good speaker engineer knows that his brainchild will be operated from a constant voltage source. He tailors the response for best performance under those conditions—*not* under constant-power conditions.

If the impedance curve is so erratic, and the actual impedance of an "8-ohm system" can be much less than that at certain frequencies, it is ever safe to parallel speakers? Sure, it's done all the time. Most amplifiers are quite tolerant and it's unlikely that you will ask the amp to deliver its full capability at any one frequency. (Prayer doesn't hurt.) But the smoother the impedance curve of the speaker, the better your amplifier will like it.

Frequency Response. The majority of loudspeaker frequency-response specs comes from one of three sources—data taken in an anechoic chamber (or outdoors, in free space), one-third-octave- (or octave-) band data taken in an unspecified listening room, or from an imaginative pencil. Data taken in an anechoic chamber is just dandy. It can help the designer to design his product, but we don't live in anechoic chambers any more than we live in goldfish bowls. And where and how we live plays a critical role in the "real" frequency response.

The size and shape of the listening room, and the placement of the speaker system within it, has a vast impact on the bass response. A few speaker systems are designed for a particular

(Continued on page 78)

the (w)hole story

For years, SAE has been producing "state-of-the-art" separate components that offer value, quality and performance. That experience has now been applied to a line of integrated amplifiers. But what's the hole for? The answer is, ultimate performance!

Unlike others, our integrateds are identical to our separates with the same designs and component parts already proven in SAE preamps and amps. But that's not all - in each of our integrateds the preamp and amp section is entirely separated (even the power supply!). The preamp section, which is identical to our 2900 (or 3000, depending on the model) has its inputs and outputs near the front (hence the need for the hole), while the amp section (2200 or 3100) is at the rear. The only common parts are the chassis and the power switch. This unusual "U" shape design provides isolation of low and high level circuits, while retaining easy access to inputs and outputs (now only 3.5" behind the front panel).

These new units are so unique we don't consider them integrateds. Instead, we call them preamp/amps. They meet all the goals of an ideal integrated; (1) Convenience of an integrated design; (2) Excellent value due to reduced packaging costs; 3) The performance of separate components.

No matter which of SAE's preamp/amps you choose - the 2922 with parametric EQ and 100 watts* per channel, 3022 with tone controls and 100 watts* per channel or the 3031 with tone controls and 50 watts* per channel, you are assured of SAE performance, quality and value. The preamp/amps are truly integrated separates. And that's the whole story.

*Per FTC Rating @ 8 ohms

For Complete Information Write:

SAE

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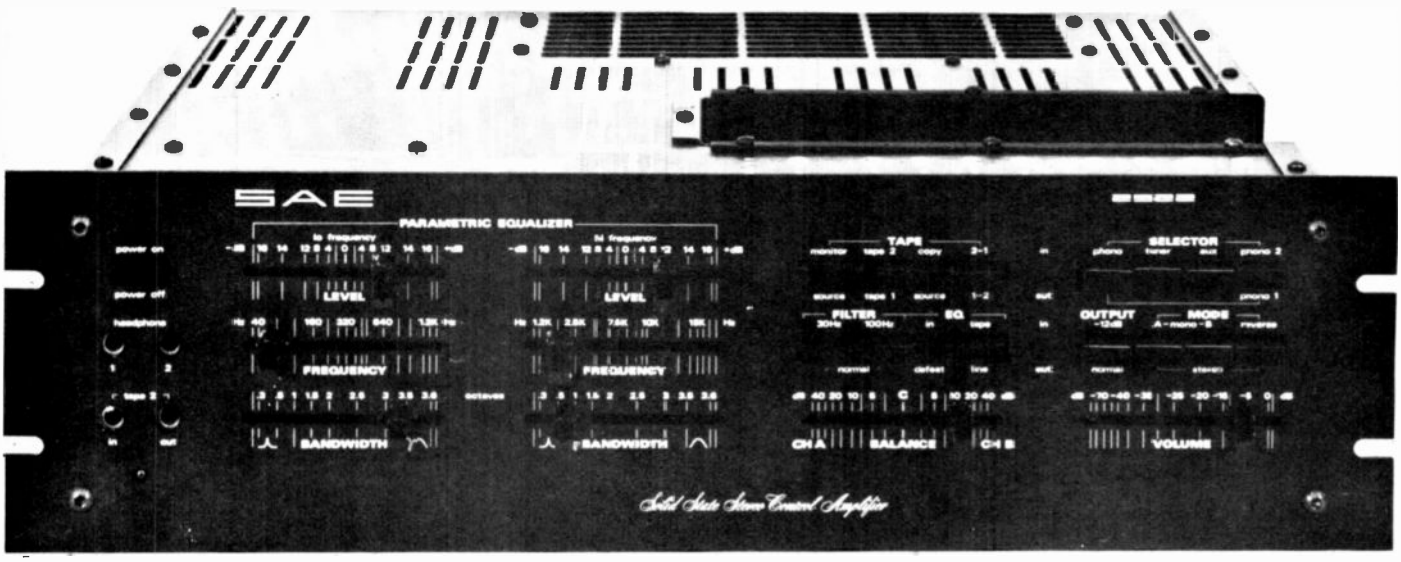
P.O. Box 60271 Terminal Annex, Los Angeles, CA 90060



2922 Pre-amp/Amp

SPOTLIGHT ON...

REVOX B77 OPEN REEL TAPE DECK

Circle No. 86 On Reader Service Card

REVOX'S NEW B77 IS LONG ON PERFORMANCE AND SHORT ON MICKEY-MOUSE FEATURES

☐ There is an immutable law of the marketplace that says "You can't get something for nothing." If a recorder is packed with operating features such as multi-track, multi-sync, 4-track, etc., either the price must go up or some electrical performance must be forsaken.

One manufacturer who has never compromised performance for operating features is Revox. Its A77—long the standard of reference for many tape fans—was known for only one thing: the best in performance. But no one ever claimed it had one single extra operating convenience. Through all the so-called "state of the art" developments in tape recorder features, the A77 plugged away without modification, still retaining its reputation as a "standard of reference." The fact that it lacked a front panel loaded with more switches and controls than a jet aircraft mattered very little.

Well, Revox has finally introduced a new model employing some new technical developments, and once again, keeping with tradition, the new model—called the B77—is long on performance and short on mickey-mouse features. Basically, Revox has produced a professional studio recorder *with a handle.*

Starting off, the B77 is a two-speed (7.5, 3.75 ips), 4-track stereo, three-head system (simultaneous record/play) reel-to-reel tape deck accommodating reel sizes to 10½ inches. Integral locks for EIA reels (standard 7-inch, small-hole 10½ inch reels) are built into the hubs.

Built into the deck itself is an *Edit-all* type splicing block, with an integral guillotine cutter. (In an Edit-all type block, the tape snaps into the groove and is retained until snapped out by the user. There are no holding clamps.)

Another editing aid is an *edit selector* that pulls back the tape lifters while forcing the tape against the playback head. This permits hand feeding of the tape for locating a particular cutting cue or sound. The reel motors and capstan are inoperative when the edit selector is being used.

A photo-optical sensor provides end-of-tape stop/disengage. The sensing system is so sensitive that it will detect the white translucent leader and will stop the tape before the leader runs off the supply or takeup reel. To bypass the sensor, as when initially loading the tape, the play or fast wind control must be held down until the leader passes the sensor.

Each channel is organized as a completely independent section with individual input selector, volume control, record mode selector, calibrated VU meter, and microphone and line input jacks. The left record input selector has positions for low level microphone, high level microphone (such as a condenser type with built-in preamplifier), radio (through a rear apron DIN connector), aux, and R-to-L (which transfers sound from the right to left channel). The right channel has identical switching except for L-to-R, which transfers sound from the left to right channel.

Monitoring is provided through two headphone jacks for use with headphones whose recommended impedance rating is 200 ohms or higher. The phones and meters are simultaneously switched from source to tape by the tape/source monitor switch. Volume is controlled by concentric-clutched left and right level controls. A monitor selector, which is only for the phones, having no effect on the meters, provides standard stereo monitoring, stereo reverse, mono, left track only, and right

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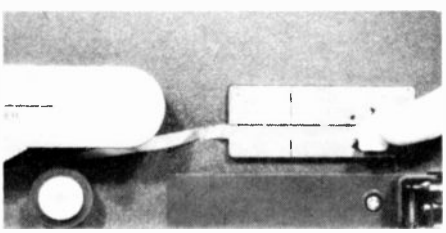
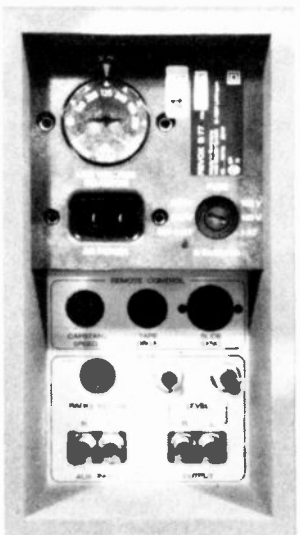


An Editall type splicing block with a built-in guillotine cutter is built into the deck directly after the capstan.

The headphone monitoring jacks have individual left and right level adjustments and a selector that permits stereo or mono monitoring, or monitoring of the individual left or right tracks.



All connections, except the microphones, are made through a rear connector panel. The line output jacks have individual level adjustments. The three dark circles are sockets for optional capstan speed, remote control, and slide syncronizer accessories.

AKG's K240 dynamic headphones employ one active transducer and 6 passive diaphragms in each earpiece. 10½ oz. $75. Circle No. 63.

HEADPHONES

CHOOSING ONE TO SUIT YOUR OWN LISTENING TASTES

by WILLIAM S. GORDON

Not everyone likes to listen to music with headphones. The sensation of having the soloist within your skull is eerie to say the least. But it's precisely this "different" stereo impression that turns on the headphone buff. For him, loudspeaker sound is distant, imprecise, and lacks immediacy and presence. To each, his own, as they say.

Headphones have several advantages over loudspeakers. Not only is the listening "private"—you can listen as loudly as you wish without disturbing a soul—but the frequency response is independent of the room acoustics. There are no standing waves to worry about, no high-frequency absorption—just unadulterated sound. A good set of phones can develop ear-shattering sound levels at lower distortion than can a loudspeaker, and it'll do so at miniscule power levels. Not only is the price of a decent set of phones much less than that of a pair of loudspeakers, but, if you listen exclusively with a headset, you needn't invest in a mammoth power amp. It's a great way to configure a high-quality

Infinity's ES-1 electrostatic headphone system includes an adaptor containing power supply and matching transformers. 9 oz. $275. Circle No. 128.

Audio Technica's newest headphone line includes the ATH-7, an electret condenser model with an impedance matching adapter. 7.4 oz. $149.95.

HEADPHONES

system at the least possible cost.

Headphone Designs—Something for Everyone. Headphones come in a variety of designs both physically and electrically. The most common headphone uses a dynamic driver very similar to that of a loudspeaker. Since it only needs to pump up the sound pressure in a small volume—that of your outer and inner ear—a very small driver can produce very good bass. In fact, a single well-designed driver can cover the frequency spectrum quite handily. Dispersion is of no concern. Your ear is always "on-axis."

Besides the dynamic type of headset, piezo-electric and electrostatic headphones are available. They are usually characterized by a very brilliant high end and by excellent transient response.

Dynamic headphones are usually of low to moderate impedance, say, 8 ohms to 600 ohms. In general, feed them a couple of watts, and they'll produce deafening sound levels. Several pairs of medium-impedance dynamics can be wired in parallel on an amplifier for multiple listening. Usually a resistor is wired either into the amplifier or into the headphone to protect drivers (and you) from excessive power levels.

Piezoelectrics are usually of somewhat higher impedance, and electrostatics, although inherently of high impedance themselves, frequently come with an "energizer box" that includes matching circuits and equalizers. The load that this

Superex offers the PRO-B VI Monitor headphones in its line. It is a two-way design, with a 10-foot cord and a weight of 18 ounces. Price: $65. For further details, circle Reader Service No. 130.

Stax offers this SR-44 electret-design headphone, an 8-ft. cord and an adaptor. 8 oz. $100. Write: 1407 N. Providence Rd., Columbia, MO 65201.

Stanton's XXI Stereo/Wafers weigh only 6 ounces. They come with a 10-foot flat cord with a heavy-duty plug. $70. Circle Reader Service No. 129.

combination presents to an amplifier is frequently much the same as that presented by a loudspeaker. Some electrostatic systems require a power level equivalent to that of a loudspeaker as well. With them, you'll still need your power amp.

Open Back or Sealed? So much for differences in drivers. There are also differences in the physical construction of headsets. Some phones are designed to operate into a sealed volume. The earcup is surrounded by a (usually) fluid-filled, soft-plastic tube. The fluid-filled pad conforms to the contour of your head and provides a "circumaural," i.e. around-the-ear, seal.

The circumaural seal has several advantages. (On occasion, they can be disadvantages as well.) Once the phones are on, you're in your own world. A good circumaural seal keeps out any extraneous noise. You won't hear the children cry or the phone ring. (Whether that's an advantage or a disadvantage, depends upon how you look at it.) Nor will you disturb anyone else. Just as outside sounds are kept out, the music is kept in. Don't try to carry on a conversation with these phones on.

The circumaural seal should distribute the clamping pressure of the headband uniformly about the ear. A good one can be quite comfortable to wear—for a while. Although the clamping pressure may not bother you, the seal effectively prevents venti-

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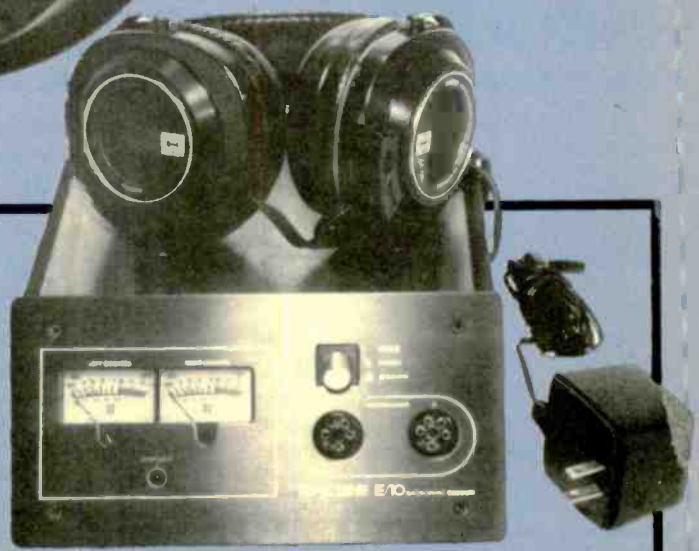
Burwen Research offers these PMB 8 orthodynamic stereo headphones. They come with a 10-foot cord and weigh 12 ounces. The earpieces are of circumaural design. $109.95. For further details, circle Reader Service Card Number 131.

Beyer Dynamic's DT-444S is a cordless stereo receiver-headphone, designed to be used with an infra-red transmitter. The duo: $410. Circle No. 133.



Koss's E/10 electrostatic headphones weigh 17 oz. and come supplied with control box, 8-ft. coil-type cord and supra-aural cushions. $300. Circle No. 76.

HOW TO AUDITION SPEAKERS

SECRETS OF BEING A CRITICAL LISTENER

■ The most difficult choice to make when you are putting together a high fidelity system is that of which speaker system to buy.

You must learn to trust your own personal judgement on the matter. You will not be able to make a wise final decision using only performance measurements or manufacturer's specification sheets. You can't depend on a friend's opinion.

You must develop a sense of what kind of sound quality you want from the speaker you buy, and you must find a speaker that meets those criteria within your own budget.

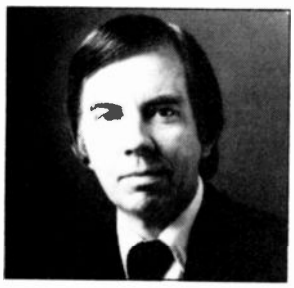
You must go into training to develop a critical ear. You must learn to separate the important considertions from the hype. You must develop a battery of crucial questions to ask yourself and your dealer.

The question is, how do you go about fine-tuning your critical listening skills?

Ask several people that question and you'll get a variety of different answers, and that's exactly what we did to put this article together for you. We asked a group of leaders in the speaker industry to offer you their personal approach to being a critical listener. We also suggested that they explain their views on what improvements still must be made, in the hope that this would shed some additional light on what you can look forward to in the way of new products.

Each individual responded in his own personal style, with emphasis placed on a variety of different areas. A wealth of advice is to be found here. You'll find both mutually shared goals and differences of opinion. You must reach your own conclusions, obviously. Use the expertise which follows as a springboard for forming your own opinions. Have fun and good luck!

—CHRIS BEGOLE



JOHN EARGLE
JBL

John Eargle is Vice-President/Product Development at JBL. He often lectures on recording practices and technology, and has recently published a book called "Sound Recording."

The inexperienced loudspeaker buyer, if he's not careful, may find himself at the mercy of fast talking sales personnel and be pushed toward a hasty decision. Here are some helpful hints for the prospective buyer:

At the outset, tell the salesman that you want to take your time and be absolutely sure of your decision. In most stores, salesmen work on a commission basis, and you could find yourself being slighted in favor of another customer who may be more inclined to make quick decisions. Try to find a salesman who will listen to what *you* have to say and will answer each of your questions.

If you have a friend who is an audiophile—and who is familiar with the price range that you are interested in—invite him or her along; a knowledgable friend is a big help in sorting out the answers.

Bring along your own program material. Leave tapes at home, and by all means do not use cassettes or cartridges. Phonograph records are certainly the best way to go here.

Insist upon hearing your records on a variety of systems with absolutely no interference from other demonstrations. This may mean avoiding busy times of the day—and even making appointments to meet with a saleman fairly early or late during the day when there is little store traffic.

Be leery of "major breakthroughs." Most of these were discovered years ago. For the most part, current

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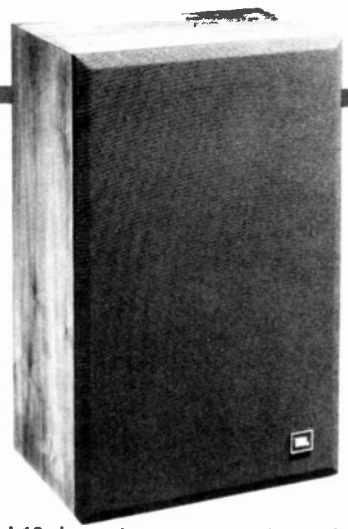

The L19 is a two-way speaker with a ducted port. Drives are a 200 mm woofer and a 36 mm tweeter. $150. Circle Reader Service No. 73.

HERB HOROWITZ
ACOUSTIC RESEARCH

Herb Horowitz is the Executive Vice-President at Teledyne Acoustic Research, is responsible for the worldwide marketing of AR products, and is a long-time leader in the audio industry.

After answering the question of size and price, there are four basic parameters of loudspeaker performance to consider. They are dispersion, power handling capacity, distortion and frequency response.

First size and price: Size of the enclosure affects cost as well as low frequency response of the system. The general rule of thumb is "the bigger the box . . . the better the bass." This means more cost for the speaker as well as a pair of larger enclosures in the listening room. Once the user has established how much he is willing to pay and how big a speaker he can fit into the room then it's time to look at the technical parameters.

Dispersion: Equal dispersion of sound in an 180 degree arc around the front of the speaker is the perfect goal. Dispersion is purely a mathematical result of the sound source. The smaller the diameter of the radiating driver the better the dispersion. With a tweeter this means smaller diameter voice coils so that great pains must be taken to make a tweeter that gives good dispersion and won't burn out due to excessive heat in the small coils.

Power handling capacity reflects how well the speaker's drivers are constructed. Small diameter wide dispersion tweeters use magnetic fluid (liquid cooling) to aid power handling. Loud sound won't damage or burn them out.

Distortion: Well-constructed speaker drivers use large magnets and heavy

(Continued on page 73)

The AR-9 sells for $650 and includes two 12-inch woofers, one low midrange driver, one upper midrange driver, and a ¾-inch tweeter. Circle No. 60.

PAUL KLIPSCH
KLIPSCH & ASSOC.

Paul W. Klipsch is founder and Chairman of the Board of Klipsch and Associates. He holds patents in many fields, including geophysics, acoustics and firearms, and is also a Fellow of the Audio Engineering Society.

Assume that the purpose of a loudspeaker is to reproduce some form of original sound. Accepting this as a definition for an "ideal" speaker, we can ask "what are the departures from the ideal?" We have to admit that the ideal or perfect speaker doesn't exist. There just ain't no such animal.

Within the above philosophical framework, we can look for "what is wrong with loudspeakers." My own well-considered opinion after a half century in the art is that the essential attributes of a loudspeaker are, in order of importance

1. Distortion at an adequate
2. Acoustic power output,
3. Polar distribution,
4. Uniformity of amplitude response.

Distortion may be defined as the generation of sounds not originally present. The worst form of this is modulation distortion. For example, 2 frequency components in the original sound, say 880 Hertz (A′) and 1046.5 (C″) form sum-and-difference frequencies of 1926.5 and 166.5 Hz, neither of which fit into the evenly tempered scale. They are "in the cracks," and form harsh dissonances. Musicians use dissonances, but when the loudspeaker produces unintended dissonances, that is distortion.

The obvious purpose of a loudspeaker is to provide a sound pressure level or loudness that is satisfactory for the listener. If the speaker is for sound reinforcement (popularly called public address), the loudness must be greater than that of the original sound.

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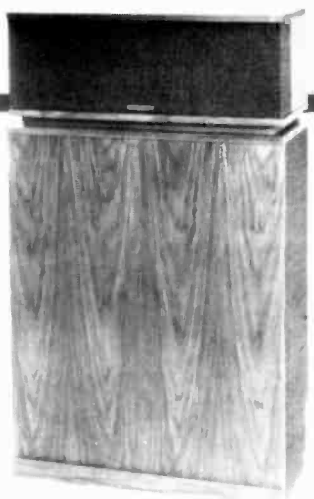

The Klipschorn is a three-way, all horn design, meant to be placed in a corner. $774 to $1651, depending on the finish. Circle Reader Service Number 137.

HOW TO AUDITION

So power output is obviously an essential attribute. But power output and distortion are inextricably interrelated. It happens that, for any given loudspeaker, distortion increases in direct proportion to the power output up to a certain output level, beyond which distortion increases at a rate which is more than directly proportional. So in the numbered list above, Items 1 and 2 are not two different things, but rather different aspects of the same thing. Speaker distortion should be specified at a stated power output.

Polar distribution is an engineering term used to denote how the speaker spreads the sound output: one would not want the distribution pattern of a fire hose, but more that of a garden spray. We feel that for home use, a speaker should concentrate 9/10 of its power output into a horizontal angle of 90 degrees.

Finally, "frequency response" is the term used to describe the uniformity of output of the speaker at different frequencies, and is usually expressed in the form of a "response curve." We concede that this is important. Undue peaks in the response curve make themselves evident as "tonal coloration," or perhaps one should call it "tonal discoloration." A peak near 500 Hz makes the speaker sound "squawky;" one at 150 makes it sound "hooty," one at 3,000 causes "shrillness" and one at 7,000 sounds spitty."

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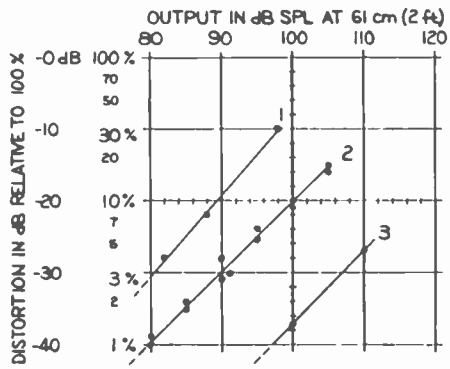
PAUL W. KLIPSCH



Distortion versus output for three speakers. (1) is a direct-radiator speaker in a 1-cubic-foot enclosure. (2) is a direct-radiator speaker in a 1½-cubic foot enclosure. (3) is a large-horn woofer design speaker occupying 16 cubic feet of space.

Courtesy Journal of the Audio Engineering Society

PHILIP COELHO
ESS

Philip H. Coelho is President and one of the three founders of ESS. He received his BS degree in Mechanical Engineering from the University of California at Davis.

Judge speaker performance by how well it reproduces live music. The goal of high fidelity equipment is, by definition, to reproduce the original sonic event as accurately as possible. Certainly most people will be able to hear that a poor quality loudspeaker is grossly inadequate anyway; but when it comes to analyzing better speakers, you must be familiar with the live music to determine that a speaker is failing within a given range or to detect the subtle deficiencies that make it fall short of being the best choice for you. If you are judging how a speaker handles a recording of a string quartet, you must be clear on what a real string quartet sounds like in concert. For this reason, I recommend that people who are sincerely interested in judging speakers attend several live performances first. This will 'sharpen' their hearing and increase their awareness of how good speakers should sound.

Compare speakers at exactly the same volume level. As a rule the speaker that is played louder, even just a little, will appear to sound better. So when you audition speakers (since some speakers are more efficient than others) it is important to adjust the volume level individually for each speaker to equalize the volume level. In this way you will be making a fair test.

Use exactly the same components in the same room when comparing speakers. In order to be certain that the differences you hear when comparing speakers are attributable *only* to the speakers you must make certain that the speaker is the only variable factor. If two speakers are compared on different equipment, perhaps even in different rooms, there is no way of knowing how much of the difference in sound is attributable to the speakers as opposed to the different components or room acoustics. Remember even changing only the phono cartridge can make a great

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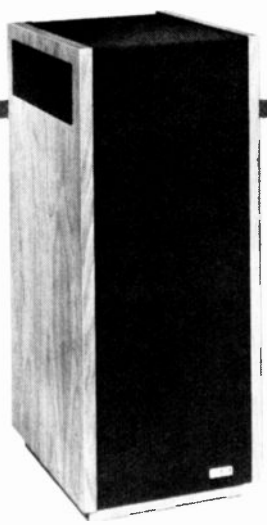

The amt Monitor includes a Heil air motion transformer, a 12-inch low frequency driver and a passive radiator element. $608. Circle No. 132.

JOHN WAWZONEK
BOSE CORP.

John Wawzonek is product manager for audio components at Bose Corporation. While working on two electrical engineering degrees at MIT, he also worked with Dr. Amar Bose on the research that preceded development of the Bose 901 speaker.

No component affects the quality of your sound system more than the speakers. And, because the performance of each speaker is affected by individual room acoustics, placement of the speaker within the room, volume level, and quality of program material, choosing a speaker can be difficult.

You start the same way a speaker design team does after all the measurements are done. You listen. And listen, and listen some more. You consider those factors which affect how a speaker sounds.

Placement. The closer the speaker to nearby surfaces—floor, ceiling, and walls—the more bass you'll hear. Nearness to large pieces of furniture can cause sound to be muffled, or blocked. And placement near other speakers can result in sound being absorbed and re-radiated.

Volume. Be aware of the fact that the level at which a speaker is played will affect its sound qualities.

Your Location. Where you, yourself are positioned in the room will affect how a speaker sounds.

Source Quality. Today, amplifiers and receivers have such outstanding electronic specs that you can assume little or no effect on speaker sound quality. But you must be sure that your phono cartridge and record are of good quality so that the cleanest signal possible reaches the speaker for your consideration.

Next, you must consider where you

(Continued on page 76)

The Model 601 direct/reflecting speaker is ported and includes six drivers, most of which are directed upward. $558 per mirror-image pair. Circle Number 66.

JOHN KOSS
KOSS CORP.

John C. Koss is the founder and Chairman of the Board of Koss Corporation. In 1958 his company sold the first stereo headphones. He is an active fundraiser for Milwaukee's educational television station, WMVS-TV.

For years audio sales people have tried to sell loudspeakers with specs, charts and technical jargon. But I've always viewed choosing stereo equipment as an auditory experience, rather than a physics experiment. Maybe at Koss we've always felt that "Hearing is Believing," and that goes for any component you choose.

Technical knowledge is without question an important aspect of quantifying loudspeaker performance patterns, particularly during their design stage. But of equal importance is the development of a "sonic vocabulary" that expresses your excitement and response in a qualitative sense.

Most everyone has enjoyed the excitement of a live performance, whether it's the symphony or a small folk group. It's the "live" sound of each instrument that we try to accurately reproduce with our "Sound of Koss." And that means designing individual transducers and systems that maintain a proper musical balance. This "musical balance" can be technically measured as a flat frequency response curve characteristic of our full range electrostatic loudspeaker, Model 1A.

Accurate balance in a loudspeaker system allows each instrument to retain its proper size and scale. Listening to loudspeakers is therefore an exercise in listening to instrumentation, with critical attention paid to the proportion assumed by each individual instrument as it combines with others to perform

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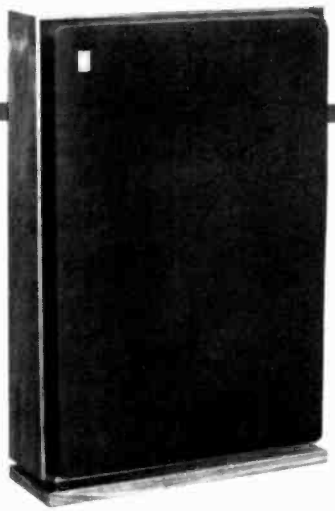


The Model One is an electrostatic speaker with a nominal impedance of four ohms. Minimum recommended amp power is 75wpc. $1050. Circle No. 76.

TODAY'S SUPER PERFORMANCE IS UP AND

Fisher's RS1080 puts out 170 watts per channel into 8 ohms with no more than 08% THD. Includes AM/FM tuner section. $1080. Mo. 69.

Hitachi's SR824 AM/FM receiver includes a Class G amplifier section which delivers 50 wpc continuously and can handle 100-watt peaks. $399.95. Circle 72.

Nikko's 1115 AM/FM receiver (175 wpc, 045% THD) accommodates up to 6 inputs and includes triple tone controls. $600. Circle 79.

the consequence of work done in the area of separates, is their remarkably high power outputs—triple the top figures of 1973. The "king" of high powered receivers *at this moment* is Pioneer's new Model SX-1980 with an output of 270 watts per channel. Upcoming, according to reports, is a new Technics receiver with output on the order of 330 watts per channel!

The most significant thing we can say about receivers is that if you are in the market for one, you'll get more for your money today than ever before. Further, you'll have a wider selection, more features to satisfy that craving for "everything but the kitchen sink," more power than you'd ever dreamed possible in a receiver, and a satisfying, high-spec product for whatever your budget might be.

Some of what has happened in receivers can be traced to what has been happening in separate audio components. As separates technology has advanced, some of it has trickled down into receiver technology. The quest for "super specs" in separate tuners, preamps, amplifiers, etc., has generated a lot of technological know-how that has been utilized to some degree in receivers. For instance, the concern with various types of distortion in separate amplifiers has resulted in receivers with far lower distortion. Some of what has been learned about preamp signal-to-noise ratios is being utilized to produce receivers with first-rate signal/noise specs. And the work in separate tuners has generated new approaches to tuner design in receivers.

But the biggest overall difference in receivers of today versus those of five years ago, and, again,

As a consequence of growing more powerful, many receivers have also grown bigger and heavier. In fact, so big and heavy that some can no longer be accommodated on a bookshelf. So what's to be done? Modularize. several companies, including Mitsubishi, Rotel, and Sansui, have decided that the best way to get around giant size and weight in high-powered receivers is to separate their tuner and preamp from their power amp, with the latter separable a few feet from the former.

We predict that super-power receivers of the future will diminish in size and weight as the technologies advance. Hitachi, for example, is exploring the potential of Class G circuitry to come up with higher power in lighter weight receivers. Kenwood and Pioneer are utilizing new approaches to thermal control. Kenwood is using smaller, more efficient heat sinks with a thermal conductivity four times greater than conventional heat sinks in its new Models 6030 and 3030. Pioneer in its latest four receivers features an exclusive new transistor

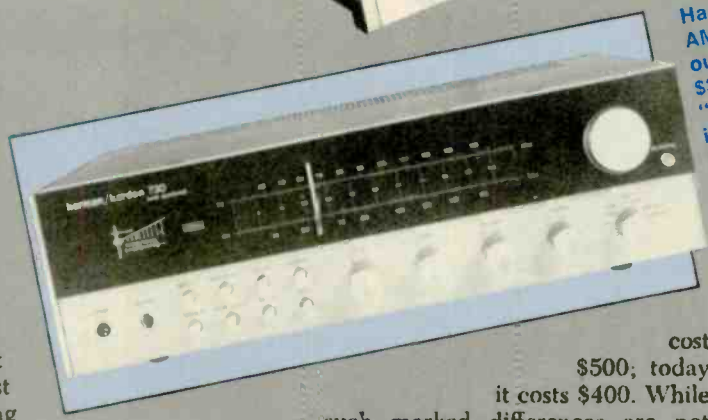
RECEIVERS

CONVENIENCE FEATURES ABOUND

by FRED PETRAS

Sansui's G-9000 AM/FM receiver offers a DC and direct-coupled amplifier section, rated at 160 watts per channel. FM section offers IF bandwidth selection. $1050. Circle No. 89.

Onkyo's TX-8500 (110 wpc, $700) features quartz-locked tuning, dual power supply, 3 tape inputs. 2 phono outputs. Circle 80.



Harman/Kardon's 730 AM/FM receiver puts out 45 wpc and costs $380. The unit is "twin-powered," that is, each channel has its own regulated power supply. No. 71.

design that increases contact between transistor body and heat sink, for decidedly better heat dissipation. The new Pioneer design allows for greater power capability with a minimum number of transistors, and reduced distortion. These and similar upcoming approaches will become manifest in high output receivers of smaller size and reduced weight.

The technology that has been filtering down from research and development in separates has resulted in many first class receivers whose specs, operating capabilities and overall flexibility match those of separate components. Hence, separates technology has spawned its own competitor—the high-powered, high-space deluxe receiver, with virtually all the controls and features found all component trios consisting of tuner, preamp and amp.

Thus, receivers continue to maintain their dominance of the audio field, even as separates continue their appeal to the highly involved, well-heeled purist buff whose audio system keeps changing from month to month as he trades off a current part of it for the latest, most advanced model.

Features to Watch For. One of the first things you'll notice as you start looking around for a new receiver is that you'll get more amplifier power for your dollar. A comparison of two 50 wpc models circa 1973 versus 1978 shows that a JVC receiver in 1973 cost $450. Today a 50 wpc JVC model costs $400. In 1973 a Pioneer 50 wpc receiver cost $500; today it costs $400. While such marked differences are not across-the-board, a key consideration is that on the whole, consumer product prices are substantially higher today than five years ago. In light of that, the fact that receiver prices have gone down is doubly remarkable.

Using the above two receivers as a reference relative to total harmonic distortion, both 1973 models had THD readings of 0.5 per cent. The equivalent current models spec out at 0.1 per cent—a substantial difference.

And that is typical of what is happening in the receiver market today, where much of the thrust is to provide cleaner, less distorted sound. To show how far the technology has advanced, consider these two specs: THD of 0.03 per cent for Optonica's 65 wpc SA-4141 receiver at $400, and 0.009 per cent for Sansui's latest "super receiver," the 220-wpc, two-piece G22000 at a deluxe price of $1,350. The latter distortion figure, according

SUPER RECEIVERS

Marantz's 2500 (250 wpc, $1600) receiver offers an oscilloscope, signal analysis system, turbo-flow heat dissipation, and FM decoder option. Circle No. 77

Sony's STR-V7 offers 130 wpc a direct-coupled DC amplifier section, tape monitor and copy facilities. $320. Circle No. 94.

Optonica offers the SA-5201 (45 wpc, $330). Features include a 41-position detented volume control and FM air check. Circle 81.

Pioneer's 270-watt SX-1980 costs $1250. Features include phono cartridge load selection, automatic pilot cancellation, DC amplifier section. Circle 85.

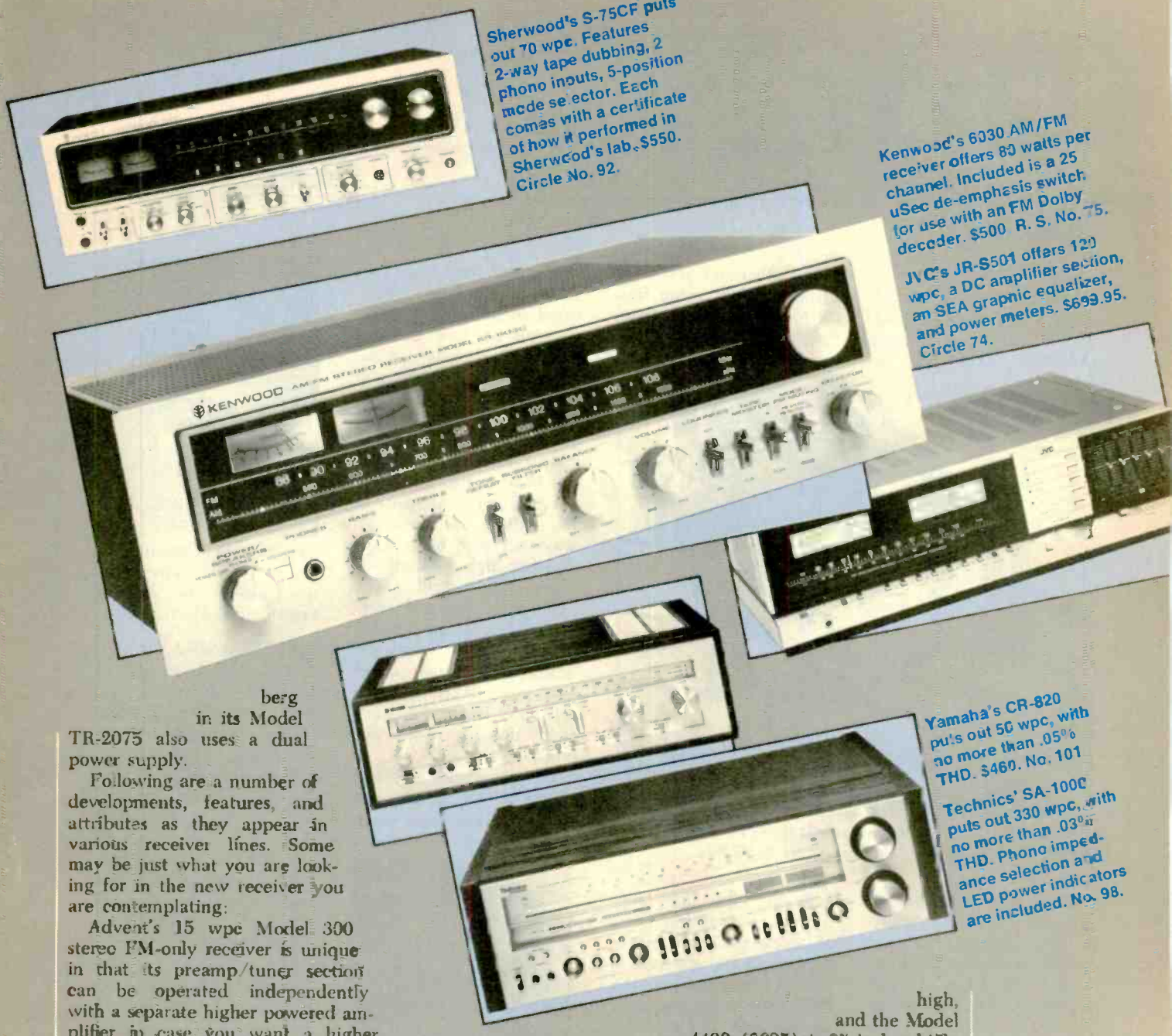
to our research, has been topped in separate amplifiers by only a handful of models.

Some dramatic improvements have also taken place in the tuner portions of receivers in the past five years. A check of a 15 wpc Marantz receiver of 1973 priced at $250 shows a capture radio reading of 3.0 dB. A current Marantz model with 16 wpc output priced at $240 boasts a capture ratio of 1.0 dB. Such a low capture radio could be important to you if you are troubled by stations operating on the same frequency simultaneously, or if multipath interference fouls your reception.

Another area where separates technology has paved the way is in amplifier design. The consequence is true DC (direct current) amplifiers, capable of amplifying signals all the way down to zero Hz. (The tag DC is also applied to "direct coupled" amplifiers, an earlier circuit concept.) Direct current amplification produces better overall sound quality, with less transient intermodulation distortion, and lower phase shift over the full audio spectrum, among other benefits.

Now you'll be able to trade up to DC amplification in receivers. Among early entrants into this derby is Sansui with its 160 wpc Model G-9000 and 120 wpc G-8000 receivers at $1,050 and $900 respectively. Their amplifier sections are described as "DC and direct-coupled to achieve a frequency response of zero Hz to 200 kHz (from main-in, −3 dB)." A high slew rate is also touted for the two sets (80 V/*u*Sec and 76 V/*u*Sec), "to ensure ultra-fast transient response." Sansui is also in the DC derby with its two-section super-receiver, the G22000 mentioned earlier, with remarkable slew rate of 150 volts per microsecond.

The effect of the power supply in amplifier sound reproduction has come under considerable study the past five years. One of the end results is amplifiers, and now receivers, with completely separate power supplies for each channel. Harman/Kardon offers twin-powered amps in its Models 430 and 730 receivers. Here's how the firm outlines their benefits: "A stereo high fidelity system is comprised of two separate channels. It is the maintenance of separation between the two channels that lends a spacious quality to the sound of the entire system. The power supply is the most essential part of any amplifier since it supplies the energy the unit needs to function. Receivers that use one power supply to furnish energy in both channels function fairly well. But under stress conditions, when the music gets too loud, or even when it demands a very large instantaneous peak, both channels of the receiver need enormous amounts of energy *simultaneously*. It is under these conditions that the single supply begins to drain, leaving the sound strained and restricted." Tand-



Sherwood's S-75CF puts out 70 wpc. Features 2-way tape dubbing, 2 phono inputs, 5-position mode selector. Each comes with a certificate of how it performed in Sherwood's lab. $550. Circle No. 92.

Kenwood's 6030 AM/FM receiver offers 80 watts per channel. Included is a 25 uSec de-emphasis switch for use with an FM Dolby decoder. $500 R. S. No. 75.

JVC's JR-S501 offers 120 wpc, a DC amplifier section, an SEA graphic equalizer, and power meters. $699.95. Circle 74.

Yamaha's CR-820 puts out 50 wpc, with no more than .05% THD. $460. No. 101

Technics' SA-1000 puts out 330 wpc, with no more than .03% THD. Phono impedance selection and LED power indicators are included. No. 98.

berg in its Model TR-2075 also uses a dual power supply.

Following are a number of developments, features, and attributes as they appear in various receiver lines. Some may be just what you are looking for in the new receiver you are contemplating:

Advent's 15 wpc Model 300 stereo FM-only receiver is unique in that its preamp/tuner section can be operated independently with a separate higher powered amplifier in case you want a higher powered system in the future. The unit is also available in a version with a switching mode power supply for full performance on 12 volts DC in vans, cars, campers, boats, etc., for additional flexibility at somewhat higher cost.

AIWA's Model AX-7500 ($360) features an extra-wide tuning dial, permitting those with vision problems to tune in stations with greater ease. It offers 30 watts per channel with no more than 0.2% total harmonic distortion.

Akai, in its Model AA-1200 ($649), features separate right and left channel output meters that are switchable to either 30-watt or 120-watt scales. You'll also find output meters in receivers in the JVC, Hitachi, U.S. Pioneer and Sansui lines.

Bang & Olufsen features receivers with the slimmest profile of any in the United States market, to the best of our knowledge. Two models, the 1900 ($495) and 2400 ($595) are only 2¾ inches high, and the Model 4400 ($695) is 3¾ inches high. The first two models feature touch-sensitive electronic switching instead of knobs, etc. The 4400 features see-through slide bars and push-lever controls, with not a knob in sight.

Built-in Dolby is a feature of Fisher's Model RS1080 ($999.95), to permit hearing the full dynamic range of Dolby broadcast music. The set also features a bass extender that boosts bass response up to 12 dB at either 45 or 80 Hz.

If you mount your receiver in a cabinet or bookshelf at a point close to the floor, you'll find Harman/Kardon's Model 230e receiver a joy in terms of tuning visibility. It features a double dial scale visible not only from the front, but also from the top edge, for maximum flexibility of placement.

Class G amplification is a feature of Hitachi Models SR804 (50 wpc), SR903 (75 wpc), and SR2004 (200 wpc). Class G circuitry delivers

(Continued on page 77)

Opera For Today

Renata Scotto

by Speight Jenkins

☐ Though the Metropolitan Opera is a house of many stars, over its more than 90 seasons there have frequently been one or two sopranos in the Italian repertory (and one or two in the German) at any given time who rank as top of the heap. At this moment Renata Scotto certainly surmounts the Italian wing. This does not for a second discount the importance of such singers as Leontyne Price, Joan Sutherland or Montserrat Caballe, but none of the three is willing to appear in more than one or at the very most two productions a year in New York. They are therefore by their scarcity treated as guests. Miss Scotto fortunately sings in a good many operas at the Met, and stands as favorite with the administration and, increasingly, with the audience.

Renata Scotto's most famous role is that of Madama Butterfly, available on disc on Angel S-36567.

It was not always thus. Miss Sutherland and Miss Price, for two, came into the Met as diamond-plated stars with the world as their oyster; Miss Scotto had to fight her way through almost ten years of neglect. There never seemed to be any reason for it, because when she first came to the company in the fall of 1965 as Madama Butterfly, she won a public, but neither the critics nor the Bing Administration were very interested.

Over the next ten years she appeared as Butterfly and a number of bel canto heroines—Lucia, Adina in *L'Elisir d'Amore*, Amina in *La Sonnambula* and Gilda in *Rigoletto*—with Violetta in *La Traviata* and Marguerite in *Faust* thrown in. But none of these seemed to make her a major star. In about 1971 she gave an interview to the *New York Times* in which she said she was not very interested in the Met because she got no new productions and no consideration.

Yet all this time she was projecting across the footlights a clear voice with perfect diction and splendid style. What she did not have at this point was much dramatic intensity in her acting—she could always act with her voice—and her high register was often very shrill. Miss Scotto's training and background led her into the bel canto repertory, which she understands more about than most singers, but the top notes were often very tight and too much like whistles.

Her connection to Maria Callas is not casual. She trained at La Scala when Callas was in her heyday there, particularly between 1952 and 1955, and she has told this reporter that she chose Callas as her idol. "There was something modern, exciting and right about what she did. I watched her and I watched the audiences, and I knew that her techniques were the way of the future." Miss Scotto studied with Callas' teachers, the venerable maestri of La Scala, and when the company was on tour in Edinburgh in 1957, she got her chance. Callas had been supposed to do only four performances of *La Sonnambula* there, but La Scala had scheduled five. Though Callas was in wretched health—with a bad cold—she sang the four, refusing to perform the uncontracted fifth performance.

Scotto shows how wonderful Gilda in Rigoletto can be when sung by a lyric not a coloratura soprano.

The title role in Donizetti's Lucia Di Lammermoor was played by Renata Scotto at the Metropolitan.

Miss Scotto stepped in and won a triumph. Then as now she was praised for the clarity of her lyric soprano and for its expressiveness, for the evenness of her range and her ability to do things with the words while keeping the line flowing.

In the early 70's came the change of administration from Rudof Bing, who never appreciated her, through Goeran Gen-

(Continued on page 75)

TEST REPORTS

Akai AA-1135 — $299.95
Circle No. 62 On Reader Service Card

RECEIVERS

AKAI AA-1135 AM/FM STEREO RECEIVER

Essentially a better quality, moderate power, general entertainment receiver. $299.95 in wood cabinet.

Description: An AM/FM stereo receiver FTC-rated at 35 watts RMS per channel into 8 ohms, at a distortion no higher than 0.2% THD, 20 to 20,000 Hz. Features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, automatic dub from/to either of two recorders, and an amplifier 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 selection, speaker selection, and tape dub/monitor selection. There are switches for power, FM muting, stereo/mono mode, and loudness compensation.

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

Overall dimensions are 18.9 in. wide x 6.1 in. high x 13.6 in. deep. Weight is 23.8 lbs.

Performance—FM Tuner: Full limiting was attained with 6 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 8 uV. The stereo high fidelity sensitivity (55 dB quieting) was 85 uV. Full mute release was attained with 30 uV.

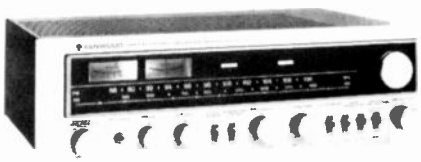
At standard test level the stereo frequency response measured +0.8/−1.2 dB from 20 to 10,000 Hz; down 3 dB at 11,500 Hz. Monophonic distortion measured 0.45% THD; stereo distortion was 0.3% THD. The signal-to-noise ratio measured 70 dB. Stereo separation was 40+ dB. Selectivity was very good.

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 40 watts RMS. The frequency response at 40 watts/8 ohms was +0.4/−0.3 dB from 20 to 20,000 Hz at a distortion no higher than 0.05% THD at any frequency.

The tone control range measured +9/−11 dB at 50 Hz; ±9 dB at 10,000 Hz.

The magnetic input hum and noise measured −67 dB; stereo separation was 57 dB. ▲



Kenwood KR-6030 – $500.00
Circle No. 75 On Reader Service Card

KENWOOD KR-6030 AM/FM STEREO RECEIVER

A notably excellent sound with an outstanding deep bass. $500.00 in metal cabinet.

Description: An AM/FM stereo receiver FTC-rated at 80 watts RMS per channel into 8 ohms with no more than 0.1% THD, 20 to 20,000 Hz. Features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, an FM mute that is always on for stereo reception, 25/50/75 μSec FM de-emphasis, 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 selection, and power/speaker selections. Switches for tone control defeat, subsonic filter, loudness compensation, tape monitor A, tape monitor B, and mode/FM muting. The de-emphasis selector switch is on the rear apron.

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

Overall dimensions are 18 23/32 in. wide x 5 7/8 in. high x 15 15/16 in. deep. Weight is 31 lbs.

Performance—FM Tuner: Full limiting was attained with 1.8 μV. The monophonic high fidelity sensitivity (60 dB quieting) measured 2.3 μV. The stereo high fidelity sensitivity (55 dB quieting) was 50 μV. Full mute release was attained with 1.4 μV.

At standard test level the stereo frequency response with 75 μSec de-emphasis measured +0.2/−1 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.09% THD. Stereo distortion was 0.08% THD. The signal-to-noise ratio measured 73 dB. With 25 μSec de-emphasis the stereo frequency response measured +0/−1.8 dB from 20 to 15,000 Hz. Distortion remained the same. The stereo separation measured 40+ dB. Selectivity was very good.

Overall, a notably excellent performer.

Performance—AM Tuner: Average.

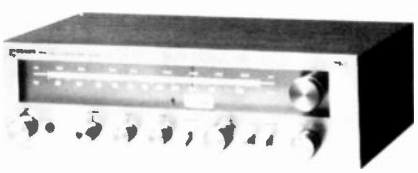
Performance—Amplifier: The power output per channel at the clipping level with both channels driven 20 to 20,000 into 8 ohms measured 88 watts RMS. The frequency response at 88 watts/8 ohms measured +0.2/−0.3 dB from 20 to 20,000 Hz at a distortion no higher than 0.04% THD at any frequency.

The tone control range measured ±10 dB at 50 Hz; ±10 dB at 10,000 Hz.

The magnetic input hum and noise was −69 dB; stereo separation was 59 dB.

The subsonic filter is down 2.4 dB at 20 Hz.

Note: According to our listening panel the deep bass is among the very best ever heard. Makes larger speakers sound even more natural. ▲



Philips 784 – $199.95
Circle No. 84 On Reader Service Card

PHILIPS 784 AM/FM STEREO RECEIVER

Essentially a better quality "general entertainment" receiver. $199.95 in metal cabinet with wood grain finish.

Description: An AM/FM stereo receiver FTC-rated at 18 watts RMS per channel into 8 ohms with no more than 0.1% THD, 20 to

☐ **Average** is the rigid performance standard we require a component to pass to make it a **good buy** in its price range. Anything less than this rating we do not consider suitable for review purposes or for you to consider buying. An **average** rating is in no way derogatory, because we have deliberately kept our standards high. For example, if a $1,000 Pilgrim receiver is rated **average**, this means it is equal to other average-rated receivers *in the same price range*, is superior to an **average** $600 Minuteman receiver, and far superior to an average-rated $200 Tory receiver. Each receiver is average within its own price range, and should be compared only with similarly priced components.

☐ **Worst case:** The test results given are the "worst case" for stereo and 4-channel equipment. For example, if the frequency response of an amplifier's left channel is ±2 dB from 20 to 20,000 Hz while the response of the right channel is ±3 dB from 20 to 20,000 Hz, the test report shows the worst case, which is ±3 dB. Similarly, if an FM tuner's stereo separation is 40 dB left-to-right and 32 dB right-to-left, the test report will show a separation of 32 dB. You can therefore be certain that the performance levels of all other channels are equal to or better than the indicated results.

☐ **Please note:** all prices listed in the test reports section, as well as prices listed elsewhere in this issue, are approximate and subject to change. Manufacturers list prices in several ways. For example, some precede all prices with "approximately," while others list "nationally advertised value." For the purpose of simplicity and consistency, our editorial policy is to report prices as prices. It is assumed that prices vary at the discretion of individual dealers and that advertised prices may change.

20,000 Hz. Features include a stereo beacon, a combination meter that serves as an FM center channel and AM signal strength tuning indicator, and an FM mute that is automatically applied when the receiver is switched for the mono mode. (In the stereo mode the mute is always off.)

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

Controls are provided for tuning, volume, balance, ganged bass, ganged treble, power 'speaker selection, and input selection. There are switches for loudness compensation, mono/stereo (FM mute applied in the mono mode), and tape monitor.

The FM antenna input is 75/300 ohms. A rod antenna is provided for AM. There is one unswitched AC outlet.

Overall dimensions are 17⅜ in. x 5⅞ in. x 14¾ in.

Performance—FM Tuner: Full limiting was attained with 4 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 8.5 uV. The stereo high fidelity sensitivity (55 dB quieting) was 65 uV. The mute release fades in between 1 to 4.5 uV, with full release attained at 4.5 uV.

At standard test level the stereo frequency response measured +1/−0.8 dB from 20 to 15,000 Hz. Monophonic distortion was 0.15% THD. Stereo distortion was 0.4% THD. The signal-to-noise ratio measured 63 dB. Stereo separation was 40+ dB. Selectivity was good.

Note: The 19 kHz stereo pilot leakage is relatively high and the MPX filter of an associated Dolby cassette deck should be switched

Philips 784 — $199.95
Circle No. 84 On Reader Service Card

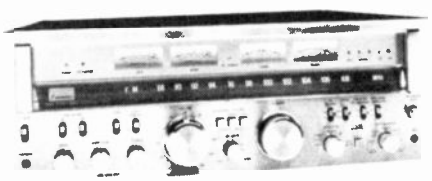
in when making FM stereo recordings.

Performance—AM Tuner: Background noise is somewhat higher than 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 19.5 watts RMS. The frequency response at 19.5 watts/8 ohms measured +0.5/−1 dB from 20 to 20,000 Hz at a distortion no higher than 0.05% THD at any frequency.

The tone control range measured ±12 dB at 50 Hz; +11/−12 dB at 10,000 Hz.

The magnetic input hum and noise measured −65 dB; stereo separation was into the noise level. ▲



Sansui G-8000 — $900.00
Circle No. 89 On Reader Service Card

SANSUI G-8000 AM/FM STEREO RECEIVER

Features FM and amplifier distortion values so low they can be measured only with the most modern of test instruments. The deep bass is particularly outstanding in sound quality. $900.00 in wood cabinet.

Description: An AM/FM stereo receiver FTC-rated at 120 watts per channel RMS into 8 ohms at a distortion no higher than 0.03% THD, 20 to 20,000 Hz. Features include a stereo beacon, FM center channel and AM/FM tuning meters, 75 and 25 μSec FM de-emphasis, front panel switched connection for a noise reduction (or 4-channel) adapter, left and right output power meters calibrated 0 to 300 watts into 8 ohms, a midband tone control, a monophonic microphone input that can be mixed with other signal sources, automatic dub from/to either of two recorders, a friction preset indicator concentric with the volume control that permits the user to establish a "stop" at the desired or maximum volume level, input, output and antenna connections on the sides (the unit can be pushed flat against the wall or cabinet), and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are stereo inputs for two magnetic phono, aux, two tape, and the noise reduction adapter. Outputs for two speaker systems, two tape, phones, and the noise reduction adapter. The preamplifier inputs and main amplifier outputs are available at side-mounted jacks.

Controls are provided for tuning, volume concentric with the presetting stop, balance, ganged bass, ganged midband, ganged treble, microphone mixing level, input selection, and tape monitor/dub selection. There are switches for the power, speaker system A, speaker system B, tone control defeat, 20 dB audio mute, loudness compensation, low filter, high filter, FM mute, Dolby FM de-emphasis (25 μSec), MPX filter, and noise reduction (4-CH) adapter in-out. A preamplifier-main amplifier separation switch is on a side panel.

Overall dimensions are 22 1/16 in. wide x 7 15/16 in high x 18 3/8 in. deep. Weight is 54.2 lbs.

Performance—FM Tuner: Full limiting was attained with 2.6 μV. The monophonic high fidelity sensitivity (60 dB quieting) measured 6.1 μV. The stereo high fidelity sensitivity. (55 dB quieting) was 38 μV. Full mute release was attained with 3.5 μV.

At standard test level the stereo frequency response using 75 μSec de-emphasis measured +0.7/−0.2 dB from 20 to 15,000 Hz.

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Monophonic distortion was 0.055% THD. Stereo distortion was 0.08% THD. The signal-to-noise ratio measured 77 dB. With 25 μSec de-emphasis the stereo frequency response measured +0.7/−1.8 dB from 20 to 15,000 Hz. Stereo distortion was 0.16% THD. Stereo separation measured 40+ dB. Selectivity was very good.

Performance—AM Tuner: Very good. Background noise was notably low.

Performance—Amplifier: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 120 watts RMS. The frequency response at 120 watts/8 ohms measured +1/−0 dB from 20 to 20,000 Hz at a distortion no higher than 0.019% THD. (The distortion at 20 Hz was only 0.006% THD.)

The tone control range measured +9/−10 dB at 50 Hz; ±5 dB at 1000 Hz; ±10 dB at 10,000 Hz.

The magnetic input hum and noise measured −71 dB stereo separation was into the noise level.

The subsonic filter was down 2 dB at 20 Hz.

The frequency response of the output meters measured "ruler flat" from 20 to 20,000 Hz. The power output calibrations from 0 to 100 watts range from 5% to 20% of the actual value. The calibrations above 120 watts, are, of course, meaningless.

The listening panel gave the FM tuner and the amplifier deep bass unusually high ratings, with particular emphasis on an outstandingly "clean" FM sound quality. ▲

Sansui G-8000 — $900.00
Circle No. 89 On Reader Service Card

SANYO JCX-2900K AM/FM STEREO RECEIVER

A high power receiver providing an unusually high degree of tone control variations. $570.00 in wood cabinet.

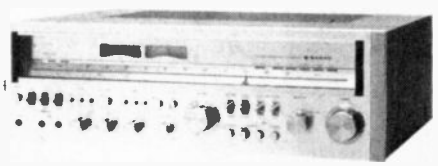
Description: An AM/FM stereo receiver FTC-rated at 120 watts per channel into 8 ohms with no more than 0.08% THD, 20 to 20,000 Hz. Features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, a midband tone control, bass tone control turnover frequencies of 100, 200 and 400 Hz, treble tone control turnover frequencies of 2500, 5000, and 10,000 Hz, automatic dub from/to either of two recorders, front panel stereo microphone inputs (which utilize the #2 phono selector switch position), and an amplifier output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are inputs for two magnetic phonos (#2 can be preempted by microphone inputs), aux, and two tape. Outputs for three speaker systems, two tape, and phones. The preamplifier outputs and main amplifier inputs are available on the rear apron.

Controls are provided for tuning, volume, balance, ganged bass, ganged midband, ganged treble, and input selection. There are switches for power, speaker system A, speaker system B, speaker system C, 100 Hz bass, 200 Hz bass, 400 Hz bass, 2500 Hz treble, 5000 Hz treble, 10,000 Hz treble, tone control defeat, low filter, high filter, 20 dB audio mute, stereo/mono, FM muting, high blend (MPX filter), loudness compensation, tape monitor 1/dub, tape monitor 2/dub, and tape dubbing on-off.

The FM antenna input is 75/300 ohms. A rod antenna and external connection are provided for AM. There are two unswitched and one switched AC outlets.

Overall dimensions are 21 1/32 in. wide x 7 3/16 in. high x 8 5/16 in.



Sanyo JCX-2900K — $570.00
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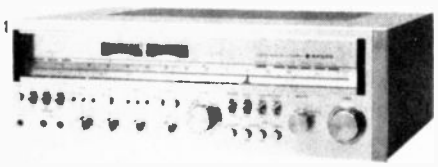

Sanyo JCX-2900K — $570.00
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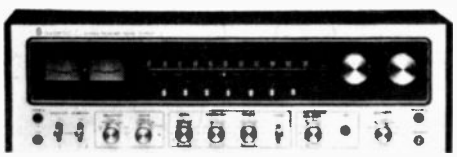


Sherwood S-110CP — $650.00
Circle No. 92 On Reader Service Card

deep. Weight is 51 lbs.

Performance—FM Tuner: Full limiting was attained with 2.3 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 6.5 uV. The stereo high fidelity sensitivity (55 dB quieting) measured 58 uV. Full mute release was attained with 5.5 uV.

At standard test level the stereo frequency response measured +0/−0.8 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.1% THD. Stereo distortion was 0.17% THD. The signal-to-noise ratio measured 73 dB. Stereo separation was 40+ dB. Selectivity was very 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 125 watts RMS. The frequency response at 125 watts/8 ohms measured +0/−0.3 dB from 20 to 20,000 Hz at a distortion no higher than 0.08% THD at any frequency.

The tone control range depends on the setting of the turnover switches. At 50 Hz: the range is ± 8 dB with a 100 Hz turnover; ±12 dB with a 200 Hz turnover; ±14 dB with a 400 Hz turnover. At 10,000 Hz: the range is ±10 dB with a 2,500 Hz turnover; ±6 dB with a 5,000 Hz turnover; ±6 dB with a 10,000 Hz turnover.

The midband tone control is centered on 1000 Hz and provides a range of +2.5/−3 dB.

The magnetic input hum and noise measured −69 dB; stereo separation was into the noise level. ▲

SHERWOOD S-110CP AM/FM STEREO RECEIVER

One of the few high performance receivers still available with 4-channel and ambient sound capability. $750.00 in wood cabinet.

Description: An AM/FM stereo receiver FTC-rated at 100 watts RMS per channel RMS into 8 ohms with no more than 0.08% THD, 20 to 20,000 Hz. Features include ARS, an Ambience Retrieval System that extracts ambient "rear" sounds ordinarily concealed within standard stereo programs, and front panel switching for a 4-channel adapter system.

Other features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, a Positune light that indicates when an FM station is tuned in properly, 75 and 25 μSec FM de-emphasis, a three-step sensitivity switch for one (#2) of two magnetic phono inputs, a midband tone control, one set of tape recorder connections duplicated on the front and rear, automatic dubbing from/to either of two recorders, a monophonic microphone input that can be mixed with any signal source, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are stereo inputs for two magnetic phono, two aux, two tape, and a 4-channel adapter. Outputs for three speaker systems (one system serving for rear speakers when using ARS), two tape, 4-channel adapter, phones, and FM detector. (Note: The 4-channel adapter connections can also be used as an extra set of tape connections.) The preamplifier outputs and main amplifier inputs are available on the rear apron along with the phono sensitivity switch.

Controls are provided for tuning, volume, balance concentric with the microphone mixing level, ganged bass, ganged midband,

ganged treble, input selection, and speaker/ARS selection. There are switches for power, tone control defeat, tape monitor selection, tape dub selection, 25/75 μSec de-emphasis, FM stereo only, FM muting, subsonic filter, high filter, 4-channel adaptor in-out, and loudness compensation.

The FM antenna input is 75/300 ohms. A rod antenna and external connection are provided for AM. One unswitched and two switched AC outlets are provided.

Overall dimensions are 21¼ in. wide x 5⅞ in. high x 15⅝ in. deep. Weight is 41 lbs.

Performance—FM Tuner: Full limiting was attained with 3.5 μV. The monophonic high fidelity sensitivity (60 dB quieting) measured 10 μV. The stereo high fidelity sensitivity (55 dB quieting) was 70 μV. Full mute release was attained with 17 μV.

At standard test level the stereo frequency response using 75 μSec de-emphasis measured +0.2/−1 dB from 20 to 20,000 Hz. Monophonic distortion measured 0.07% THD. Stereo distortion was 0.12% THD. The signal-to-noise ratio measured 64 dB. Using 25 μSec de-emphasis the stereo frequency response measured the same, while the stereo distortion was 0.17% THD. Stereo separation measured 40+ dB. Selectivity was very good. The Positune lamp offers no tuning advantage over the center channel tuning meter.

Performance—AM Tuner: Average with lower than average background noise level. (Overall, an unusually quiet tuner.)

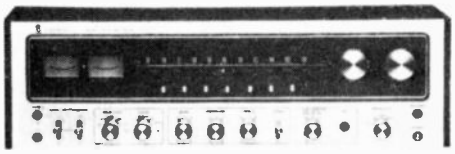
Performance—Amplifier: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 10 watts RMS. The frequency response at 100 watts/8 ohms measured +0/−2 dB from 20 to 20,000 Hz at a distortion no higher than 0.07% THD at any frequency.

The tone control range measured +8/−13 dB at 50 Hz; +4/−5 dB at 1000 Hz; ±9 dB at 10,000 Hz.

The magnetic input hum and noise measured −73 dB; stereo separation was 54 dB.

The ARS ambient recovery system has no noticeable effect on the available front channels output power.

The subsonic filter was down 3 dB at 2 Hz. ▲



Sherwood S-110CP — $650.00
Circle No. 92 On Reader Service Card

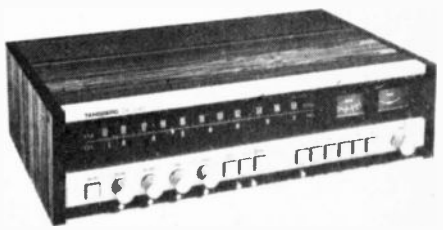
TANDBERG TR-2040 FM RECEIVER

Very good overall sound quality plus the advantage of five FM preset stations in addition to manual tuning. $530.00 in wood cabinet.

Description: An FM stereo receiver FTC-rated at 40 watts RMS per channel into 8 ohms with less than 0.09% THD, 20 to 20,000 Hz. Features include a stereo beacon, FM center channel meter, AM/FM signal strength meter that also serves as the calibrated tuning dial for five FM preset selectors, automatic dubbing from/to either of two recorders, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

Each FM preset has a tuning control whose frequency adjustment is indicated by an 88 to 108 MHz calibration on the signal strength meter, which is switched from the signal strength to frequency indicator mode when a preset selector switch is "punched up."

There are inputs for magnetic phono and two tape. Outputs for



Tandberg TR-2040 — $530.00
Circle No. 97 On Reader Service Card

Tandberg TR-2040 — $530.00
Circle No. 97 On Reader Service Card

two speaker systems, two tape, and phones. All audio connections are DIN. DIN to phono jack adapter cables are provided for one tape and the phono. DIN plugs are supplied for both speaker outputs.

Controls are provided for tuning, volume, balance, ganged bass, ganged treble, and five FM preset station selectors. There are switches for power, tape monitor 1/dub, tape monitor 2/dub, phono input selector, FM selector, five FM preset selectors, FM muting, loudness compensation, mono/stereo, low filter, high filter, speaker system A, and speaker system B.

The antenna input is 75/300 ohms.

Overall dimensions are 20⅛ in. wide x 5⅝ in. high x 12⅝ in. deep. Weight is 21 lbs.

Performance—FM Tuner: Full limiting was attained with 3.2 μV. The monophonic high fidelity sensitivity (60 dB quieting) measured 7.5 μV. The stereo high fidelity sensitivity (55 dB quieting) was 90 μV. Full mute release was attained with 12 μV.

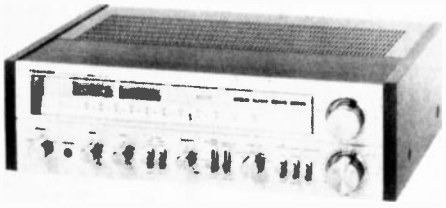
At standard test level the stereo frequency response measured +1/−0.5 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.22% THD. Stereo distortion was 0.55% THD. The signal-to-noise ratio measured 70 dB. Stereo separation was 40+ dB. The selectivity was very good. Note: Slightly lower distortion values were attained by tuning very slightly to the right of the meter-indicated center channel.

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 +0.1/−2.0 dB from 20 to 20,000 Hz at a distortion no higher than 0.05% THD at any frequency. With the tone controls at their indicated "center" position—there are no "center" detents on the controls.

The tone control range measured +14/−13 dB at 50 Hz; +15/−17 dB at 10,000 Hz.

The magnetic input hum and noise measured 71 dB; stereo separation was essentially into the noise level.

Performance—Preset Tuning Meter: When any of the five FM preset selectors is "punched up" the signal strength meter converts into a frequency indicator for the adjustment of the associated reset tuning control. The meter calibration is notably accurate, so much so that if the manual tuning is set to the same frequency the same signal will be heard when switching between manual and preset tuning. While this should be the expected result, it is generally not the case. Few electrical preset tuning indicators are as precise as the one on this receiver. ▲



Toshiba SA-750 — $350.00
Circle No. 99 On Reader Service Card

TOSHIBA SA-750 AM/FM STEREO RECEIVER

Features both 75 and 25 uSec FM de-emphasis. $350.00 in wood cabinet.

Description: An AM/FM stereo receiver FTC-rated at 50 watts RMS per channel into 8 ohms 20 to 20,000 Hz, at no more than 0.08% THD. Features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, 75 and 25 uSec FM de-emphasis, automatic dubbing to and from either of two recorders, and an amplifier 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/FM de-emphasis selection, and speaker selection. There are switches for low filter, high filter, tape monitor selector, tape dubbing selector, FM mute, mono/stereo, and loudness compensation.

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

Overall dimensions are 18.9 in. wide x 5.7 in. high x 15.8 in. deep. Weight is 28.6 lbs.

Performance—FM Tuner: Full limiting was attained with 5.5 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 11 uV. The stereo high fidelity sensitivity (55 dB quieting) was 90 uV. Full mute release was attained with 5 uV.

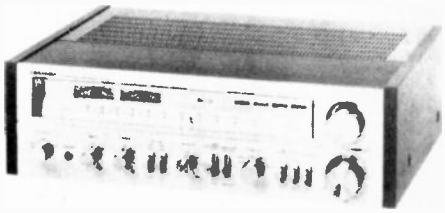
At standard test level the stereo frequency response with 75 uSec de-emphasis measured +0/−2 dB from 20 to 12,000 Hz; down 3 dB at 12,500 Hz. With 25 uSec de-emphasis the stereo frequency response measured +0/−1 dB from 20 to 15,000 Hz. Monophonic distortion was 0.13% THD; stereo distortion was 0.41% THD. The signal-to-noise ratio measured 65 dB. Stereo separation was 40+ dB. Selectivity was very good.

Performance—AM Tuner: Sensitivity was somewhat lower than 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 51.5 watts RMS. The frequency response at 51.5 watts/8 ohms measured +0/−0.8 dB from 20 to 20,000 Hz at a distortion no higher than 0.05% THD at any frequency.

The tone control range measured +11/−12 dB at 50 Hz. +10/−9 dB at 10,000 Hz.

The magnetic input hum and noise measured −68 dB; stereo separation was into the noise level. ▲



Toshiba SA-750 — $350.00
Circle No. 99 On Reader Service Card

YAMAHA CR-420 AM/FM STEREO RECEIVER

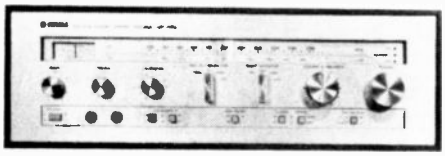
A better quality general entertainment receiver. $280.00 in wood cabinet.

Description: An AM/FM stereo receiver FTC-rated at 22 watts RMS per channel into 8 ohms at a distortion no higher than 0.05% THD, 20 to 20,000 Hz. Features include a stereo beacon, combination FM center channel/AM signal strength tuning meter, a separate tape input selector that permits taping one signal source while listening to another, a special antenna terminal connector that uses the FM antenna for AM reception, an FM mute that provides only mono reception when off, variable loudness compensation, and an amplifier output hold-off that prevents power supply turn-on transients from being fed to the speakers.

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

Controls are provided for tuning, concentric volume/balance, ganged bass, ganged treble, loudness compensation, input selection, and tape input selection. There are switches for power,

Yamaha CR-420 — $280.00
Circle No. 101 On Reader Service Card



Yamaha CR-420 — $280.00
Circle No. 101 On Reader Service Card

speaker system A, speaker System B, high filter, AM/FM, mono/stereo, and FM mute on (auto mono/stereo)/FM mute off (mono only).

The FM antenna input is 75/300 ohms. A connection is provided for the AM antenna along with a jumper bar that permits one leg of the FM antenna to be used for AM.

Overall dimensions are 17¾ in. wide x 6⅓ in. high x 12¾ in. deep, Weight is 19 lbs.

Performance—FM Tuner: Full limiting was attained with 5 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 6.5 uV. The stereo high fidelity sensitivity (55 dB quieting) was 110 uV. Full mute relase was attained with 10 uV.

At standard test level the stereo frequency response measured +0/−2.2 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.13% THD. Stereo distortion was 0.9% THD. The signal-to-noise ratio measured 76 dB. Stereo separation was 40+ dB. Selectivity was good.

Performance—AM Tuner: Ranged from average to poor depending on the length and orientation of the wire used for the antenna.

Performance—Amplifier: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 24.8 watts RMS. The frequency response at 24.8 watts/8 ohms measured +0/−0.4 dB from 20 to 20,000 Hz at a distortion no higher than 0.025% THD at any frequency.

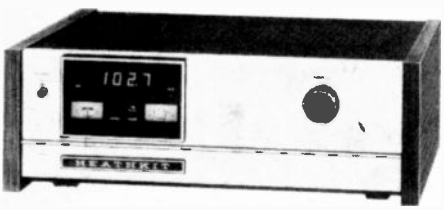
The tone control range measured ±12 dB at 50 Hz; ±7.5 dB at 10,000 Hz.

The magnetic input hum and noise measured −69 dB; stereo separation was 58 dB. ▲

TUNERS

HEATHKIT AJ-1515 AM/FM DIGITAL TUNER

Features excellent FM selectivity and a digital frequency readout for AM and FM. $379.95 (in kit form) includes metal cabinet with wood trim.



Heathkit AJ-1515 — $379.95
Circle No. 31 On Reader Service Card

Description: An AM/FM stereo tuner with an L.E.D. digital frequency indicator having *odd* calibration (99.1, 99.3, 99.5, etc.) for FM, and 10 kHz per step calibration for AM (990, 1000, 1010, 1020, etc.); the American standard station frequency spacing for both AM and FM. Other features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, and a prewired compartment with associated front panel switching for an optional FM Dolby decoder. The FM de-emphasis is automatically switched from 75 to 25 uSec when the Dolby decoder is switched in.

There are outputs for line level and an oscilloscope multipath indicator.

Only a tuning control is located on the front panel. Individual left and right screwdriver-adjust output level controls are provided on the rear apron. There are front panel switches for power, AM, FM, mono, FM mute defeat, blend (mpx noise filter), and Dolby (when the tuner is so equipped).

The FM antenna input is 75/300 ohms. The AM antenna input

is a plug-in flexible loop 6 feet in diameter with a 4-foot connecting cable. One unswitched AC outlet is provided.

Overall dimensions are 17½ in. wide x 6⅛ in. high x 14¼ in. deep. Weight is 27 lbs.

Performance—FM Tuner: Full limiting was attained with 3.8 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 6 uV. The stereo high fidelity sensitivity (55 dB quieting) was 48 uV. The mute release level is user set, and is normally adjusted to release at a minimal signal-to-noise ratio selected by the user while listening to a weak signal(s).

At standard test level the stereo frequency response with 75 uSec de-emphasis (non-Dolby) measured +0.1/−0.8 dB from 20 to 15,000 Hz. Monophonic distortion was 0.19% THD. Stereo distortion was 0.6%THD. The signal-to-noise ratio measured 72 dB. Stereo separation was 40+ dB. Selectivity was excellent. (Note: Lower stereo distortion is attained with the tuning set slightly off the meter-indicated center channel.)

With the Dolby adaptor installed (25 uSec de-emphasis) the frequency response measured +0.1/−1.8 dB from 20 to 15,000 Hz. Distortion and signal-to-noise ratio remained essentially the same. The Dolby on the tested model had been factory aligned and was one of the best we've used. The user can adjust the Dolby reference level, and it is possible for the user to set the Dolby for his or her personal preference in the way of noise suppression.

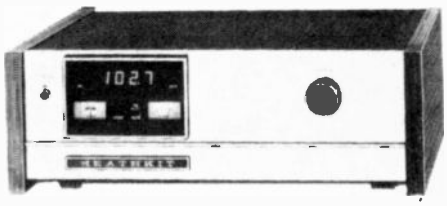
The maximum output level of the tuner corresponding to 100% modulation of the transmitter measured 700 mV.

Performance—AM Tuner: Average.

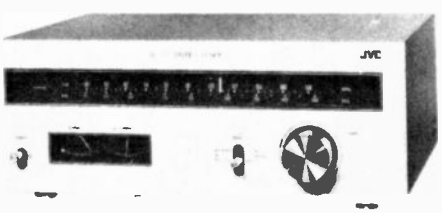
Performance—Digital Frequency Indicator: The digital frequency indicator is the red L.E.D. (light emitting diode) type commonly found on modern frequency counters and even CB transceivers. Unlike digital control whereby the oscillators used for tuning the AM and FM front ends are part of the counter circuit, in this tuner the oscillators are conventional and the digital frequency indicator is simply an indication of the local oscillator's frequency, corrected so as to display the *tuned* frequency. Because of this arrangement it is possible to tune through almost 200 kHz of an FM channel while the frequency display remains locked "rock steady" to the center channel frequency. The same "broad tuning range" is true of the AM tuning.

By limiting of the counter's lock range, the display always indicates the correct FM or AM center frequency as long as the tuning is within the channel frequency bandwidth. As soon as the tuning passes into the bandwidth of the adjacent channel the frequency display changes to indicate the new, and correct, center channel frequency.

Because the frequency is displayed even with the tuning considerably off the center channel frequency, final AM and FM tuning adjustment is performed in the normal manner using the FM center channel and AM/FM signal strength tuning meters. ▲



Heathkit AJ-1515 – $379.95
Circle No. 31 On Reader Service Card



JVC JT-V11 – $149.95
Circle No. 74 On Reader Service Card

JVC JT-V11 AM/FM STEREO TUNER

Good choice if you're looking for a component system at rock-bottom prices. Has very good AM. $149.95 in metal cabinet.

Description: An AM/FM stereo tuner featuring a stereo beacon, FM center channel and AM/FM signal strength tuning meters, and

JVC JT-V11 — $149.95
Circle No. 74 On Reader Service Card

an FM mute that is always on in the FM auto (mono or FM determined by signal strength) mode, and always off in the mono-only mode.

There is one set of line level outputs.

The front panel has a tuning control and switches for power and AM/FM auto (mute on)/FM only (mute off) selection.

The FM antenna input is 75/300 ohms. A rod antenna and external connection are provided for AM.

Overall dimensions are 5½ in. wide x 6 in. high x 14½ in. deep. Weight is 11 lbs.

Performance—FM tuner: Full limiting was attained with 8 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 7 uV. The stereo high fidelity sensitivity (55 dB quieting) was 80 uV. Full mute release was attained with 11 uV.

At standard test level the stereo frequency response measured +0.2/−1 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.18% THD. Stereo distortion was 0.38% THD. The signal-to-noise ratio measured 75 dB. Stereo separation was 37 dB. Selectivity was good. The output level corresponding to 100% modulation of the transmitter measured 640 mV.

Note: Low distortion is attained over a rather broad tuning range. The FM center channel meter need not be precisely centered for lowest distortion.

Performance—AM Tuner: Unusually high sensitivity and low background noise. Overall performance is much higher than average. ▲

PIONEER TX-5500 II AM/FM STEREO TUNER

Good choice if you're looking for a component system at rock-bottom prices. $150.00, includes metal cabinet.

Pioneer TX-5500 II — $150.00
Circle No. 85 On Reader Service Card

Description: An AM/FM stereo tuner featuring a stereo beacon, 75 and 25 uSec FM de-emphasis, and a dual purpose meter that serves as an FM center channel and AM signal strength tuning indicator.

There is one set of outputs at line level.

The front panel has a tuning control and switches for power, and AM/FM/FM with mute. A switch on the rear apron selects 75 or 25 uSec FM de-emphasis.

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

Overall dimensions are 14⅜ in. wide x 4⅞ in. high x 10⅝ in. deep. Weight is 7.7 lbs.

Performance—FM Tuner: Full limiting was attained with 4 uV. The monophonic high fidelity sensitivity (60 dB quieting) measured 6 uV. The stereo high fidelity sensitivity (55 dB quieting) was 100 uV. Full mute release was attained with 2.5 uV.

At standard test level the stereo frequency response with 75 uSec de-emphasis measured +0/−2 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.22% THD. Stereo distortion was 0.5% THD. The signal-to-noise ratio measured 70 dB. Stereo separation was 40+ dB. Selectivity was good.

With 25 uSec de-emphasis the frequency response measured +0/−2.8 dB from 20 to 15,000 Hz. Other parameters remained

the same.

The output level corresponding to 100% modulation of the transmitter was 440 mV.

Note: tuning is extremely critical for minimal distortion. The 19 kHz stereo pilot leakage is only 39 dB down; if you are using a Dolby for tape recordings it must be a model with a built-in, or switch selected, mpx (19 kHz) filter.)

Performance: AM Tuner: Average. ▲

INTEGRATED AMPLIFIERS

HEATHKIT AA-1515 INTEGRATED STEREO AMPLIFIER

Good performance through the build-it-yourself route. $299.95 in kit form includes metal cabinet with wood trim.

Description: An integrated stereo amplifier FTC-rated at 70 watts RMS per channel into 8 ohms with less than 0.08% THD, 20 to 20,000 Hz. Features include left and right output power meters calibrated 0 to 60 watts into 8 ohms and −30 to +3 dB, with 0 dB representing 60 watts, front panel input and output tape dubbing jacks, one of two tape inputs through the input selector switch, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are inputs for two magnetic phono, aux, tuner, and two tape. Outputs for two speaker systems, two tape, and phones. The tape dubbing output jack also provides a signal feed after the volume, balance, and tone controls. The preamplifier outputs and main amplifier inputs are available at rear apron jacks.

Controls are provided for volume, balance, ganged bass, ganged treble, and input selection. There are switches for power, speaker system 1, speaker system 2, tone control defeat, low filter, high filter, loudness compensation, tape monitor, tape dubbing, and mono/stereo.

Switched and unswitched AC outlets are provided.

Overall dimensions are 18⅛ in. wide x 6¾ in. high x 15 in. deep. Weight is 30 lbs.

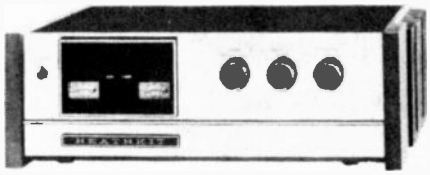
Performance—Amplifier: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 71 watts RMS. The frequency response at 71 watts/8 ohms measured +0/−0.2 dB from 20 to 20,000 Hz at a distortion no higher than 0.05% THD at any frequency.

The tone control range measured ±12.5 dB at 50 Hz; ±8 dB at 10,000 Hz.

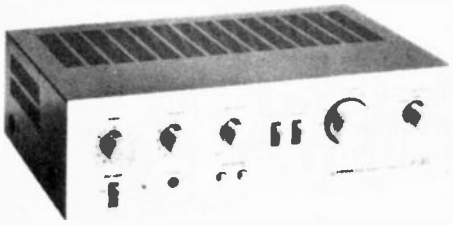
The magnetic input hum and noise measured −70 dB; stereo separation was 68 dB.

Performance—Meters: The meters indicated 60 watts (0 dB) when the amplifier delivered its rated output of 70 watts. At very low power levels the meter error is 50%, for example, the meters indicated 0.6 watts when the actual output was 0.32 watts. Their frequency response is absolutely ruler-flat from 20 to 20,000 Hz.

The meters are semi-peak indicating on program material, with a slow decay. ▲



Heathkit AA-1515 — $299.95
Circle No. 31 On Reader Service Card



Pioneer SA-5500 II — $125.00
Circle No. 85 On Reader Service Card

PIONEER SA-5500 II INTEGRATED STEREO AMPLIFIER

Good choice for a lower power, component system at a rock-bottom price. $125.00, in metal cabinet.

Description: An integrated stereo amplifier FTC-rated at 15 watts RMS per channel into 8 ohms at less than 0.5% THD, 20 to 20,000 Hz.

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

Controls are provided for volume, ganged bass, ganged treble, balance, and input selection. There are switches for power, tape monitor, loudness compensation, speaker system A, and speaker system B.

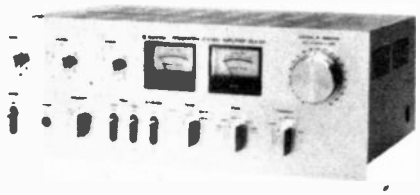
Three AC outlets are provided (two switched, one unswitched).

Overall dimensions are 14⅛ in. wide x 4⅞ in. high x 10⅜ in deep. Weight is 11.4 lbs.

Performance: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 15 watts RMS. The frequency response at 15 watts/8 ohms was +0/−0.2 dB from 20 to 20,000 Hz at a distortion no higher than 0.2% THD at any frequency.

The tone control range measured +9/−9.5 dB at 50 Hz; ±7.5 dB at 10,000 Hz.

The magnetic input hum and noise measured −67 dB; stereo separation was 63 dB. ▲



Sanyo DCA-611 — $249.95
Circle No. 107 On Reader Service Card

SANYO DCA 611 INTEGRATED AMPLIFIER

Moderately high power in a small cabinet. $249.95 in metal cabinet.

Description: An integrated stereo amplifier FTC-rated at 60 watts RMS per channel into 8 ohms with distortion no higher than 0.08% THD, 20 to 20,000 Hz. Features include left and right output power meters calibrated 0.02 to 60 watts into 8 ohms, automatic dub from/to either of two recorders, a front panel tape output jack, a midband tone control, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are inputs for two magnetic phono, aux, tuner, and two tape. Outputs for two speaker systems, two tape (the #2 output duplicated on the front panel), and phones.

Controls are provided for concentric volume/balance, ganged bass, ganged midband, ganged treble, input selection, speaker selection, mono/stereo modes, and tape monitor/dubbing selector. There are switches for power, low filter, high filter, and loudness compensation.

Overall dimensions are 16½ in. wide x 5⅞ in. high x 13¾ in. deep. Weight is 22 lbs.

Performance: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 63.8 watts RMS. The frequency response at 63.8 watts/8 ohms measured +0/−1.8 dB from 20 to 20,000 Hz at a distortion no higher than 0.075% THD at any frequency.

The tone control range measured ±14 dB at 50 Hz; ±9.5 dB

at 1000 Hz; ±11 dB at 10,000 Hz.

The magnetic input hum and noise measured −62 dB; stereo separation was into the noise level.

Performance—Meters: Maximum output reading accuracy is at approximately 50 to 1000 Hz, with sharply reduced response beyond these limits. At 1000 Hz, power output indications are within approximately 28% of the true value; for example, 43 watts output indicates 60 watts on the meters. ▲

POWER AMPLIFIERS

BGW 410 STEREO POWER AMPLIFIER

Plain brute-force power at notably low distortion. $699.95.

Description: A stereo power amplifier FTC-rated at 200 watts RMS per channel into 8 ohms at no more than 0.07% THD, 20 to 20,000 Hz. Unit features left and right power output "meters" consisting of 10 LEDS (light emitting diodes) per meter providing color-coded (green, yellow, red) calibrations for 8 ohm loads of 0.1, 0.4, 1.5, 6, 12, 25, 50, 100, and 200 watts. Also calibrated in decibles: ∞, −33, −27, −21, −15, −12, −9, −6, −3, −0 dB. A three step sensitivity switch provides a maximum reference level of 0 dB, −10 dB, and −20 dB. An output hold-off prevents power supply turn-on transients from being fed to the speakers.

Inputs are at line level. There are outputs for two speaker systems and phones.

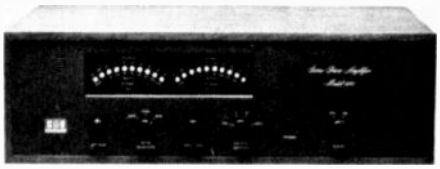
Controls are provided for left gain and right gain. Switches for power, speaker selection, and meter sensitivity.

Overall dimensions are 19 in. wide x 5¼ in. high x 11¾ in. deep. Weight is 35 lbs.

Performance: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 212 watts RMS. The frequency response at 212 watts/8 ohms measured +0/−0.3 dB from 20 to 20,000 Hz at a distortion no higher than 0.1% THD at any frequency. At the FTC-rated power output of 200 watts the distortion did not exceed 0.07% THD at any frequency. The signal-to-noise ratio was 92 dB.

Rated power output was attained with a 2.2 volt input.

The LED meter indications are essentially flat within the illumination of one lamp from 20 to 20,000 Hz. Since the lamps have a "glow range" in the sense the illumination fades up and down as power output varies, each lamp is an approximation of the output power for example, the 6 watt lamp will "show color" over the range of 6 to 18 watts. ▲



BGW 410 — $699.95
Circle No. 135 On Reader Service Card

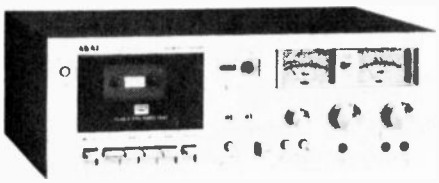
CASSETTE DECKS

AKAI GXC-725D STEREO CASSETTE DECK

Provides a 3-head system and two levels of "normal" bias. $425.00 in wood cabinet.

Description: A front-loading 3-head system Dolby cassette deck featuring a selector for "normal" (low bias), "normal" (high bias),

Akai GXC-725D — $425.00
Circle No. 62 On Reader Service Card



Akai GXC-725D — $425.00
Circle No. 62 On Reader Service Card

Fisher CR-4025 — $249.95
Circle No. 69 On Reader Service Card

Ferrichrome, and chrome tapes, two calibrated VU meters, a peak record level indicator, automatic end of tape stop-disengage, and a reset counter.

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

Controls are provided for left record level, right record level, and ganged output level. Switches for power, Dolby, Dolby mpx filter, tape type, and tape/source monitor.

The tape mechanism has piano key controls for stop/eject, record interlock, REW, FWD, FF, and pause.

Overall dimensions are 17.3 in. wide x 6.5 in. high x 11.2 in. deep. Weight is 15.2 lbs.

Performance: The playback from a standard test tape with a frequency range of 50 to 10,000 Hz measured +1.2/−1 dB.

Using BASF Professional I tape; without Dolby, the record/play frequency response measured +1.8/−3 dB from 35 to 15,000 Hz. Distortion at the meter-indicated 0-VU record level measured 0.2% THD with 12 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 44 dB. With the Dolby active the record/play frequency response was ±3 dB from 35 to 15,000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level was 52 dB wideband, 60 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured +0.5/−3 dB from 35 to 15,000 Hz. Distortion at the meter-indicated 0-VU record level was 0.4% THD with 10 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 48 dB wideband, 54 dB narrowband.

Using TDK-SA tape for *chrome* (as suggested in the manual): with Dolby, the record/play frequency response measured +1.2/−3 dB from 35 to 15,000 Hz. Distortion at the meter-indicated 0-VU record level was 0.2% THD with 11 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 47 dB wideband, 52 dB narrowband.

The maximum output level corresponding to a 0-VU record level was nominally 400 mV.

The peak indicator lamp is indicated as +7 dB. The lamp reached full brilliance when the record level was +8 dB above 0-VU record level.

Wow and flutter measured 0.12% with peaks to 0.17%. ▲

FISHER CR-4025 STEREO CASSETTE DECK

Features a wireless remote pause control and very good results with rock-bottom priced tape. $249.95 in metal cabinet with wood grain finish.

Description: A front-loading Dolby cassette deck featuring remote control of the pause function for record and play. The remote control unit is a hand-held "transmitter" powered by two AA-type batteries. Other features include a selector for "normal" and chrome tapes (BASF Professional Type II chrome tape is recommended by the manufacturer), two calibrated VU meters, automatic end of tape stop/disengage, a reset counter, and a front panel lamp that indicates when the pause lever is down (the re-

mote control causes the pause lever to be pulled down into the pause mode).

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

Controls are provided for left record level and right record level. Switches for power, micro/line input selection, Dolby on-off, and tape type.

The tape mechanism has lever controls for the record interlock, REW, forward, FF, pause, and stop/eject.

Overall dimensions are 15⅛ in. wide x 6 in. high x 11⅞ in. deep.

Performance: The playback from a standard test tape with a 50 to 10,000 Hz frequency range measured +2.5/−1 dB.

Using TDK type D tape: without Dolby, the record/play frequency response measured +1.2/−3 dB from 52 to 15,000 Hz. Distortion at the meter-indicated 0-VU record level was 1.3% THD with a 6 dB headroom to 3% THD. The signal-to-noise ratic referenced to 0-VU record level measured 47 dB.

With the Dolby active, the record/play frequency response remained essentially the same (excellent Dolby tracking with this tape) as did the distortion and headroom. The signal-to-noise ratio measured 49 dB wideband, 59 dB narrowband.

Using BASF Professional II tape (the tape recommended): with Dolby, the record/play frequency response measured +1/−3 dB from 40 to 14,000 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 54 dB wideband, 64 dB narrowband.

The output level corresponding to a 0-VU record level was nominally 720 mV.

Wow and flutter measured 0.15% with peaks to 0.2%.

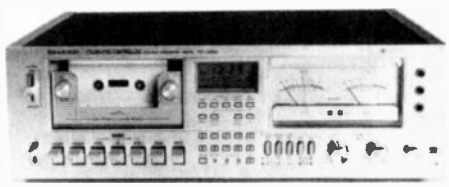
The wireless remote control system has an effective range of about 20 feet when the control is pointed directly at the front panel of the tape deck. In a room with uncovered walls and ceilings (paneling or plaster) the remote will trigger if the control unit is pointed in virtually any direction other than straight down at the carpet. Pressing the button on the remote control causes the pause lever to be pulled down by an internal electro-mechanical device. A red panel light illuminates when the pause lever is down. Pressing the remote button again causes the remote lever to be released. In this manner the commercials of a broadcast being taped can be edited out from the listening location. (A very effective remote control device.) The remote unit is powered by two AA-type batteries which should provide many months of service. ▲

Fisher CR-4025 — $249.95
Circle No. 69 On Reader Service Card

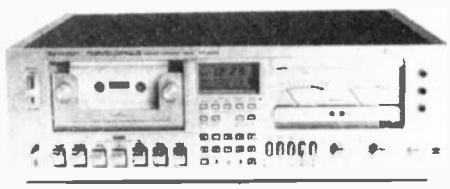
SHARP RT-3388 COMPUTER-CONTROLLED CASSETTE DECK

Its on-board microprocessor (computer) allows virtually any timing, selection, or auto-control combination. $349.95 in metal cabinet with wood trim.

Description: A front-loading Dolby stereo cassette deck featuring an on-board microprocessor that provides an LCD (liquid crystal display) clock, timer and function display, as well as computer control of timing, program selection through Sharp's Automatic Program Locate Device (APLD), running time, partial-cueing



Sharp RT-3388 — $349.95
Circle No. 134 On Reader Service Card



Sharp RT-3388 – $349.95
Circle No. 134 On Reader Service Card

search, memory, and virtually every possible combination of automatic start and stop keyed to a 12- or 24-hour clock (as determined by the user). Two ordinary AA penlight batteries maintain the computer's programming in the event AC power is deliberately or inadvertently removed. The computer automatically switches to battery power for its memory when AC is removed. (Under normal conditions the batteries should last their "shelf life.")

Other features include microphone/line input mixing; an *editor* (which disables the input signal as long as a key is depressed while the recorder keeps running); bias and equalization selectors for "normal," Ferrichrome, and chromium dioxide type (Maxell UD/XL II specified) tapes; two calibrated VU meters; automatic end of tape stop/disengage; and a peak record level indicator.

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

Controls are provided for concentric-clutched left and right microphone level, concentric-clutched left and right line level, and ganged output level. There are switches for power/auto control/clock-only, LCD display light (used only when there is no room light), memory rewind, Dolby, bias, equalization, and 21 pushbuttons for the clock/microprocessor programming.

The tape mechanism has piano key controls for pause, record interlock, REW, FWD, FF, stop, eject, and edit.

Overall dimensions are 17⅞ in. wide x 5⅞ in. high x 14⅜ in. deep.

Performance—Recorder: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured +2.4/−1 dB.

Using Maxell UD/XL Type I tape: without Dolby, the record/play frequency response measured +0/−3 dB from 30 to 13,500 Hz. Distortion at the meter-indicated 0-VU record level was 0.9% THD with 8 dB headroom to 3% THD. The signal-to-noise ratio referenced to a 0-VU record level measured 48 dB. With the Dolby active, the record/play frequency response measured +0/−3 dB from 30 to 11,300 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level was 50 dB wideband, 59 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured +1/−3 dB from 30 to 12,000 Hz. Distortion at the meter-indicated 0-VU record level was 1.1% THD with 8 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 50 dB wideband, 61 dB narrowband.

Using Maxell UD/XL Type II tape (the specified *chrome* tape for this recorder): with Dolby, the record/play frequency response measured +1.5/−3 dB from 30 to 10,000 Hz. Distortion referenced to 0-VU record level was 0.8% THD with 9 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 52 dB wideband, 61 dB narrowband.

The maximum output level corresponding to a 0-VU record level was nominally 800 mV.

The peak record level indicator lamp turns on when the signal level is 7 dB above 0-VU.

Wow and flutter measured 0.09% steady.

Performance—Microprocessor: The unusually large 1¼ x 2½ inch LCD display indicates the time (clock) and all counting and control functions of the microprocessor. The main clock can be user-

programmed for 12- or 24-hour display. When 12-hour display is selected, AM and PM are also indicated. The timer function can be programmed to turn on or off at any given time for both record and play. The APLD function can be programmed to locate any of up to 19 selections at a time. (For proper operation APLD requires approximately 3 seconds of "dead air" between selections.) The microprocessor also provides an electronic digital tape counter, and can locate a program by its counter number.

The degree of microprocessor control is so great, hands-on experience at your local showroom is required for a full appreciation of its operation and possibilities. ▲

SONY TC-K7 II STEREO CASSETTE DECK

Features better than average deep bass performance. $500.00, in metal cabinet with wood trim.

Description: A front-loading, two-motor Dolby cassette deck featuring microphone/line mixing, a headphone level control, bias and equalization selectors for "normal" (low bias), "normal" (high bias), Ferrichrome, and chromium dioxide tapes, two calibrated VU meters, a three-step peak record level indicator (0 dB, +4 dB, +8 dB), a record level limiter, a prewired socket for an optional remote control timer, REC mute (disables signal to record head while tape runs and signal is indicated by meters and output monitor), automatic end of tape shut-off, and a memory reset counter with stop, or start after rewind.

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

Controls are provided for concentric left and right microphone level, concentric left and right level, ganged output level, and headphone volume. There are switches for power, timer control, limiter, bias, equalization, REC mute, and counter memory mode.

The tape mechanism has pushbuttons for the record interlock, stop, REW, FWD, FF, and pause. There is a push-bar for eject.

One unswitched AC outlet is provided.

Overall dimensions are 18⅛ in. wide x 6¾ in. high x 12¼ in. deep. Weight is 24.3 lbs.

Performance: The playback from a standard test tape with a 50 to 10,000 frequency range measured +2/−1 dB.

Using BASF Professional I tape: without Dolby, the frequency response measured +0.8/−0.5 dB from 30 to 14,000 Hz down 2 dB at 20 Hz and 3 dB at 15,000 Hz. Distortion at the meter-indicated 0-VU record level was 0.3% THD with 8 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 48 dB. With the Dolby active, the frequency response was the same at the low end, 1.5 dB down at 13,000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level measured 51 dB wideband, 58 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured +1 dB from 20 to 14,000 Hz; down 2 dB at 15,000 Hz. Distortion at the meter-indicated 0-VU record level was 0.8% THD with 7 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 48 dB wideband, 58 dB narrowband.

Using Memorex chromium dioxide tape: with Dolby, the record/play frequency response measured +0.5/−1.2 dB from 30 to

Sony TC-K7 II —$500.00
Circle No. 94 On Reader Service Card

15,000 Hz; down 3.8 dB at 20 Hz. Distortion at the meter-indicated 0-VU record level was 1.5% THD with 5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 51 dB wideband, 59 dB narrowband.

The maximum output level corresponding to a 0-VU record level was nominally 600 mV.

The peak record level indicators were precisely on the mark at 0, +4, and +8 dB.

The record level limiter cut in at +3 dB and has a moderate release, providing protection against excessive peak record levels without "pumping" of low level signals.

Wow and flutter measured 0.1% with peaks to 0.13%. ▲

REEL-TO-REEL

REVOX B77 REEL-TO-REEL TAPE DECK

Words simply cannot describe the clean, apparently noiseless and uncolored recordings of the B77. $995.00.

Revox B77 — $995.00
Circle No. 86 On Reader Service Card

Description: A two-speed (7.5, 3.75 ips) three-head system (simultaneous record/play), three-motor, four-track stereo recorder accommodating reel sizes to 10½ inches. Features include two calibrated VU meters, two headphone outputs (for phones rated 200 ohms or higher) with a headphone level control, a headphone monitor function selector (stereo, stereo reverse, left, right, mono), an edit selector that moves the tape against the play head (no capstan or reel motors) for hand feeding, a built-in splicing block with guillotine-like cutter, prewired sockets for optional slide synchronizer, capstan speed controller, and full remote control switcher, a reset counter, optical end of tape stop/disengage, individual left and right record selectors, and S.O.S. (sound on sound), echo, and overdub effects.

There are inputs for low and high output microphones, aux, and radio (through DIN connector). There are outputs for line and two phones.

Controls are provided for left record level, right record level, left input selection, right input selection, headphone monitor level, and headphone function selector. Left and right "screwdriver adjust" output controls are located on the rear. There are switches for power, tape speed, reel size (7-, 10-inch), tape/source monitor, left record selector, and right record selector.

The tape mechanism has push-tabs for the record interlock, play, stop, REW, FF, and pause.

Overall dimensions are 17.8 in. wide x 16.3 in. high x 8.14 in. deep.

Performance: At 7.5 ips, the playback from a standard test tape with a 50 to 15,000 Hz range measured +2.2/−0 dB. At 3.75 ips, the playback from a standard test tape with a 50 to 7500 Hz range measured +2.2 dB from 75 to 7500 Hz, rising to +4 dB at 50 Hz.

Note: The machine was supplied factory adjusted for Scotch type 207 tape and all tests were performed with this tape.

At 7.5 ips, the record/play frequency response measured +0.5/−0.7 dB from 30 to 20,000 Hz, down 1.8 dB at 20 Hz. Distortion

at the meter-indicated 0-VU record level was 0.6% THD with 7 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level measured 53 dB wideband.

At 3.75 ips, the record/play frequency response measured ±1 dB from 30 to 18,000 Hz, down 3 dB at 20 Hz. Distortion at the meter-indicated 0-VU record level was 0.95% THD with 5.5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 51 dB.

The maximum output corresponding to a 0-VU record level was 700 mV.

Wow and flutter measured 0.04% steady at 7.5 ips; 0.08% steady at 3.75 ips.

Note: The frequency distribution of the background noise does not peak in the ear's most sensitive range and recordings actually sound almost noiseless. Also, the sound is extremely clean, the equal of many fine studio recorders. Neither the "quiet" background or unusually clean sound can be illustrated by measurements; you must hear them for yourself. Mechanically, and in terms of operating ease, the machine is among the very finest, if not in fact worthy of being used as the standard of reference. ▲

RECORD PLAYERS

MITSUBISHI DP-EC2 AUTOMATIC RECORD PLAYER

Improves the sound quality of even high performance pickups. Outstanding warped-record tracking. Appears to be essentially the model DP-EC1 less automatic speed selection and 10-inch indexing. Overall, a beautiful machine. $400.00 includes integral base and dust cover.

Description: A two-speed (33, 45) single record manual/automatic record player. A photo-optical system determines the tonearm indexing for 7- and 12-inch records and also prevents the tonearm from lowering when there is no record on the platter. The unit cycles to off at the end of each record in both the manual and automatic modes; it can, however, be programmed for continuous repeat play.

A full-time illuminated strobe is provided for both speeds though there is only one speed adjustment (used for both speeds). Switches are provided for speed selection and repeat play. Touch buttons for start/cue (tracking cue), and stop (reject)/lift.

The tonearm lift differs from the usual lift/lower arrangement. If the start button is held down, the tonearm will track across the record while raised, stopping when the button is released; then the tonearm lowers to the record. If the stop/lift button is held down briefly the tonearm is raised and the position maintained; if the button is pressed rapidly the unit cycles to off.

The tonearm has a micrometer-adjust counterweight that also serves as a 0 to 3 gram stylus force (VTF) adjustment calibrated in 0.1-gram increments. There is a calibrated anti-skate. The pickup mounts in a universal-type plug-in shell for which a stylus overhang gauge is provided. The gauge serves for several other pickup alignment functions, and tonearm user-adjustments allow a relatively high degree of pickup-to-tonearm optimization. The output cable capacity measured nominally 80 pF.

Mitsubishi DP-EC2 — $400.00
Circle No. 78 On Reader Service Card

Performance: All speeds held constant over an applied test voltage range of 90 to 140 VAC with total immunity to transient line voltage variations.

The pitch control range measured +3.7/–2.4% at 33 rpm; +4.7/–3.8% at 45 rpm. Wow and flutter measured 0.08% with peaks to 0.15%.

The stylus force adjustment could be set within a 0.2-gram accuracy.

The listening panel reported that even the highest quality pickups seemed to sound "somewhat better than usual" on this player, with outstanding warped-record tracking (equalled by few other players). ▲

Circle No. 81 On Reader Service Card

OPTONICA RP-1414 RECORD PLAYER

Has very high resistance to external shock and vibration. An excellent budget choice if you have shakey floors and furniture. $139.95 includes base and dust cover.

Description: A two-speed (33, 45) record player with integral base and dust cover; user provides the pickup. The mechanism is manual start with automatic end-of-play cycle to off. The motor always starts when the tonearm is moved off its rest, it stops when the arm is returned to the rest.

There are controls for speed selection, cut (reject), and tonearm lift.

The tonearm has an adjustable counterweight and an 0-4 gram stylus force adjustment calibrated in full gram increments. There is a calibrated anti-skate with stops for two grams and three grams. The pickup mounts in a universal plug-in shell. No stylus overhang gauge is provided. The overhang is measured to 50 cm. with a ruler or a full scale illustration in the manual can be used as a guide (lay the pickup and shell over the illustration).

Performance: Both speeds held constant over an applied test range of 100 to 140 volts, with essentially total immunity to transient line voltage variations. Speed accuracy was essentially precise. Wow and flutter measured 0.05% with peaks to 0.15%.

The tonearm's stylus force adjustment could be estimated with ¼-gram accuracy.

The system is unusually resistant to external shock and vibration, and is recommended when a turntable must be mounted on shakey floors, shelves, or cabinets. ▲

HEADPHONES

KOSS PRO/4 AAA STEREO HEADPHONES

A very efficient set of headphones. $70.00.

Weight: 18 oz. Cord: 6 feet long, coil type. The Pro/4 AAA's have a cushioned headband and circumaural phone cushions. Pressure on the ears and overall sense of weight is moderate. Sound quality includes deep bass and somewhat "hot" highs. Average definition. These headphones are very efficient and can create extremely high sound levels, using low-power amplifiers. ▲

Koss PRO/4 AAA – $70.00
Circle No. 76 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 preamp, and two Bozak B-400 speakers.

◎ Cilea: *Adriana Lecouvreur* (Opera in four acts.) Renata Scotto, soprano (Adriana Lecouvreur); Placido Domingo, tenor (Maurizio); Sherrill Milnes, baritone (Michonnet); Elena Obraztsova, mezzo-soprano (Princess de Bouillon); Giancarlo Luccardi, bass (Prince de Bouillon); and others with the Ambrosian Opera Chorus and the Philharmonia Orch., cond. James Levine, Columbia M3 34588, three records.

Cilea's *verismo* opera is a perfect vehicle for a singing actress and ever since its premiere in 1902 it has attracted the best singers of the day. The plot is incredibly involved, replete with mistaken identity, political intrigue and jealous love affairs, ending as Adriana is poisoned by a box of faded violets only to live long enough to greet her lover and die in his arms. What matters is the music. Cilea's score is brimfull of marvelous tunes—Italian opera at its best. This new Columbia recording is outstandingly good in every way. Scotto, who has lately experienced considerable vocal difficulties in live performances, is in good form here and makes much of the title role. Obraztsova is absolutely stunning as the Princess. Domingo and Milnes are superb, and Levine directs the proceedings energetically. Sonically, too, this set is first-rate, with the singers well balanced against the rich orchestral sounds. London's older recording with Tebaldi, Del Monaco and Simionato still has much to offer, but Columbia's new recording is uniformly strong in casting and should delight all opera aficionados.

◎ Elgar: *Pomp and Circumstance Marches, Op. 39; Cockaigne Overture, Op. 40; God Save The Queen;* London Philharmonic Orch., cond. Sir Georg Solti, London CS 7072.

A knockout LP. Solti is at his most vigorous and the London Philharmonic in top form superbly reproduced by London's recording engineers. The five Pomp and Circumstance Marches are immediately appealing. Although the fame of the familiar first has completely overshadowed the others, they still have much to offer the listener. Of Elgar's three concert overtures, *Cockaigne* is easily the most worthy, a colorful tone picture of London, premiered in 1901 with Hans Richter conducting. Ever since the old Westminster recording of this overture with Sir Adrain Boult conducting *Cockaigne* has been an audio test piece, and it has never before sounded better than it does here. Elgar's one-minute arrangement of the British national anthem *God Save The Queen,* written by Elgar for the coronation of Edward

Immediately appealing

VII, fills out the second side. In spite of the glories of this new recording, I would not want to be without London's Stereo Treasury disc of the five *Pomp and Circumstance Marches* played by the London Symphony conducted by Sir Arthur Bliss; recording which offers perhaps a lighter-textured view of them but is recorded with more natural resonance.

◎ Haydn: *Symphony No. 103 in E Flat, "Drum Roll"; Symphony No. 87 in A.* Amsterdam Concertgebouw Orch., cond. Colin Davis, Philips 9500 303.

Davis and the Concertgebouw continue their superlative Haydn series with this magnificent recording. These readings are marked by a rare combination of grace and spirit with full-bodied orchestral weight. The string playing throughout is magnificent, the rich sound of the lower strings is particularly ingratiating, and the woodwinds have that glowing Concertgebouw sound. Dorati's complete set of the Hayden symphonies on London Stereo

Grace and spirit

Treasury has countless merits and a bargain price, but this new Davis recording as well as the previously released LP containing symphonies number 88 and 99 (9500 138) has its own unique spot in the Haydn discography.

◎ Mussorgsky: *Songs and Dances of Death.* Galina Vishnevskaya, soprano; London Philharmonic Orch., cond. Mstislav Rostropovich, Angel S 37403.

This song cycle is one of the most remarkable ever written, settings of poems by Golenishchev-Kutuzov all of which focus on death as the enemy of mankind. Mussorgsky's score contains some of his most powerful writing and on this new recording is heard in Shostakovitch's stark orchestration. This version was premiered in 1962 with Vishnevskaya as soloist and Rostropovich conducting and it is fitting that they now record it. However, it is unfortunate that it was not recorded at that time. The famous Russian soprano has always had more than a touch of the typical Slavic wobble, which has been intensified by the passing years. Her recent Deutsche Grammophon recording of *Tosca* (also with Rostropovich conducting) is the sound of a singer in vocal decline, and she is no better on this new Angel disc. The upper range

Stark orchestration

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is forced, harsh and decidedly unpleasant to hear, in spite of her obvious musicianship and interpretive insights. She also has been recorded with much echo, perhaps an attempt on the part of the producers to make her voice sound more palatable. The overside offers arias from *Sadko*, *The Tsar's Bride* and *The Snow Maiden*, again with moments of great beauty, marred by vocal inadequacy. Full texts and translations are provided but there seems to be some confusion about the orchestra involved. The recent label and front of the jacket indicate it is the London Philharmonic, while the back of the album states it is the London Symphony.

◎ **Puccini: *Madama Butterfly*. Montserrat Caballe, soprano (Cio-Cio-San); Bernabe Marti, tenor (Pinkerton); Silvana Mazzieri, mezzo-soprano (Suzuki); Piero de Palma, tenor (Goro); Franco Bordoni, baritone (Sharpless); Maria Uriz, mezzo-soprano (Kate Pinkerton); and others with the Barcelona Symphony Orch. and Chorus; Armando Gatto, cond., London OSA 13121, three records.**

The current LP catalog is rich in "Butterflies" and compared with them this new London recording is sadly lacking. Caballé is in relatively good form (although, surprisingly she does not take the alternate high ending of the act one entrance), but hardly convincing in the role, and from there on it goes—downhill. Martí, who is Caballé's husband, has to his credit a fine disc of Spanish zarzuela arias, but he is no match for Bjoerling, Pavarotti and Bergonzi as Pinkerton. The remainder of the cast, with the exception of Piero de Palma, is nondescript, the orchestral and choral contribution lacklustre. The glories of "Butterfly" are far better expressed in London's beautiful recording with Mirella Freni, Pavarotti and Karajan, RCA's with Price, Tucker and Leinsdorf, or Angel's with Scotto, Bergonzi and Barbirolli.

◎ **Rachmaninoff: *Piano Concerto No. 3 in D Minor, Op. 30*. Vladimir Horowitz, pianist; New York Philharmonic, cond. Eugene Ormandy, RCA Victor CRL1-2633.**

Vladimir Horowitz, now a young 73, has been a legendary figure on the pianistic scene for decades, and the prospect of him performing again with an orchestra for the first time in a quarter of a century, excited the musical world. The event took place January 8, 1978 in Carnegie Hall at a concert to benefit the New York Philharmonic. Rachmaninoff's *Concerto No. 3* has long been associated with Horowitz; he has already recorded it twice. Once in the early 1930s with the London Symphony conducted by Albert Coates, a recording still available on Seraphim, and again in 1951 for RCA with Fritz Reiner conducting a small studio orchestra. The 1930 recording is an exciting affair, not note-perfect but a fascinating glimpse into the early career of Horowitz. The Reiner collaboration was a happy one musically, but the recorded sound is decidedly substandard even by sonic standards of the fifties, so a new recording was definitely needed. This new RCA disc indicates that for technical reasons some portions of the concerto were rerecorded following the concert. There are no obvious tape splices, and it is impossible to tell just how much of what is heard actually is from the historic concert. Horowitz is in top form and does not disappoint. There is plenty of tension, and the limpid, cool soft playing is contrasted with some stunning pianistic fireworks. Horowitz plays the concerto without the cuts he honored in his two previous recordings, but still plays the original version of the first movement cadenza, feeling that the alternate one that is much in favor nowadays is too overpowering for the scope of the concerto. Ormandy's collaboration is perfection, and the New York Philharmonic provides a glowing accompaniment. I am not very happy about the reproduction. The piano tone is often brittle, with the orchestra often blurred and lacking in detail. However, even with its sonic limitations, this recording does convey the unique performance and the disc is well worth owning.

◎ **Rachmaninoff: *Piano Concerto No. 4 in G Minor, Op. 40, Rhapsody on a Theme of Paganini, Op. 43*, Tamas Vasary, pianist, with the London Symphony Orch., cond. Yuri Ahronovitch, Deutsche Grammophon 2530 905.**

This recording concludes Deutsche Grammophon's Rachmaninoff set with these artists. Like the previous releases, this recording is marked by consistently exquisite playing by Vásáry, and strong, sensitive accompaniment from Ahronovitch and the London Symphony. Vasary's approach to the "Rhapsody" is more lyric than dynamic; he makes much of the 18th variation as one would expect. The *Concerto No. 4* is highly effective in this expressively broad treatment. Some listeners might wish for a bit more

Sumptuously engineered

Diablerie in both of these scores, to be found in Earl Wild's collaboration with Jascha Horenstein and the Royal Philharmonic on Quintessence. The DG disc is sumptuously engineered.

◎ **Ravel: *Bolero, La Valse, Le Tombeau de Couprin, Pavane pour une infante de funte*, Amsterdam Concertgebouw Orch., cond. Bernard Haitink. Philips 9500 314.**

Not too long ago Philips released a Ravel disc with Bernard Haitink and the Concertgebouw containing *Rapso-*

Vividly recorded

die espagnole, Menuet antique, Valses nobles et sentimentales and *Alborada del gracioso* (9500 347), that was extraordinary in every way, with superlative performances vividly recorded. This new LP offers similar qualities. What a pleasure it is to hear this atmospheric music played with such rich orchestral sound! I don't think I've ever heard a more satisfying performance of *La Valse*, more exciting perhaps, but not played with the virtuosity displayed here. How unfortunate that Haitink's much earlier Ravel disc with the Concertgebouw (suites from *Daphnis and Chloe*, and *Mother Goose Suite*) is sonically not equal to the two LPs discussed above.

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◎ **Ravel: *Gaspard de la nuit; Valses nobles et sentimentales; Ma Mere l'Oye.* Emanuel Ax, pianist, RCA Victor ARL1-25302.**

This young pianist hasn't made a disappointing record yet; his earlier releases of Chopin, Liszt, Beethoven and Dvorak are intensely satisfying. Here he turns his attention to Impressionism and gives a stunning account of *Gaspard de la nuit*, Ravel's best-known and technically most demanding work for solo piano. Ax misses none of the macabre atmosphere of this score, the shimmering imagery of Ondine, the tolling bell of Le Gibet or the scintillating brilliance of Scarbo. *Valses nobles et sentimentales* have the appropriate lilt, and Ax's wife, Yoko Nozaki, joins him in a sensitive performance of the Mother Goose suite in the original version for piano, four hands. Excellent reproduction from RCA's engineers.

◎ **Respighi: *The Pines of Rome, Roman Festivals*, Cleveland Orch., cond. Lorin Maazel, London CS 7043.**

There's always room for another top-notch recording of the *Pines of Rome*, particularly when it is as well produced as this magnificent London

A frenzy of orchestral excitement

release. The Cleveland Orchestra is virtually without equal as a virtuoso ensemble, and they are in splendid form here. The engineering is unusually vivid, and every strand of Respighi's remarkable orchestration is crystal clear. The *Pines of the Appian Way* builds to a stunning climax, although I would have liked to have heard the timpani a bit more in the slow buildup. *Roman Festivals* is less familiar fare, but with a score even more colorful than *The Pines*. In this Respighi describes four different Roman scenes, with a huge orchestra heavy on brass and percussion, with a mandolin for the lovely serenade in the third section. The symphonic poem opens barbarically with a scene depicting Christians being thrown to the lions, with the orchestra contrasting the snarling of wild animals against a religious song. The second section is *The Jubilee* as pilgrims search for the holy city singing a hymn of praise as church bells ring, and the third is *The October Festival*, a gentle scene with a romantic interlude interrupted by the cacophony of the finale. The fourth section is *The Epiphany*, a carnival scene *par excellence*, leading to a frenzy of orchestral excitement. Maazel's interpretation of both symphonic poems, although without the tremendous excitement of Toscanini's old NBC Symphony recording (it was Toscanini who premiered the score February 29, 1929 with the New York Philharmonic).

◎ **Rimsky-Korsakov: *Capriccio espagnol, Op. 34.* Mussorgsky: *Night on Bald Mountain.* Borodin: *In the Steppes of Central Asia.* Glinka: *Russlan and Ludmilla Overture, Valse-Fantasie.* Orchestra of Paris, cond. Mstislav Rostropovich, Angel S 37464.**

Rostropovich, now music director of Washington's National Symphony Orchestra, has now started what doubtless will be a long career as a conductor to complement his already remarkable career as one of the world's finest cellists. His conducting debut on Angel was a colorful account of Rimsky-Korsakov's *Scheherazade*, followed by a highly individual but compelling account of all of Tchaikovsky's symphonies. Continuing in this vein we have this new all-Russian disc of familiar orchestra showpieces. Performance standards are high, with the French orchestra in good form, and the reproduction is similar to Rostropovich's earlier recordings: broad, spacious and somewhat lacking in bass definition.

◎ **Sibelius: *En Saga, Op. 9; Tapiola, Op. 112; Finlandia, Op. 26; The Swan of Tuonela, Op. 22.* Berlin Philharmonic Orch., cond. Herbert von Karajan, Angel S 37408.**

Karajan is a supreme interpreter of works of the Finnish master, and this new disc is a remarkable accomplishment. *En Saga* and *Tapiola* are two of Sibelius's finest works, music of raw, forboding power conjuring up the bleak Finnish scenario with its brooding mystery and savage images. Karajan gives both symphonic poems vital performances, with urgent tempi that are almost a bit too brisk. The other two more familiar works are superbly, presented

A marvelous reproduction

Finlandia emerging as a massive miniature, *Swan of Tuonela* an exquisite mournful episode of melancholy with the important English horn solo played to perfection by Gerhard Stempnik. Angel's reproduction is marvelous, big in scope and capturing to near-perfection the lustrous sounds of the Berlin Philharmonic. Highly recommended.

◎ **Stravinsky: *Petrouchka.* Chicago Symphony Orch., cond. James Levine, RCA Victor ARL1-2615.**

I have not been very fond of Levine's recordings with the Chicago Symphony Orchestra. Some critics have raved about the excellences of his performances of the first and third Brahms symphonies while I find them overly impulsive, albeit beautifully played. RCA's engineering lacks a natural hall resonance, the strings are somewhat thin, there is no richness in the bass, and everything sounds rather analytically

Light textured engineering

antiseptic. How unfortunate that Levine's Chicago recordings do not have the sonic excellence of his disc with the London Symphony of Dvorak's Cello Concerto (with Lynn Harrell as sterling soloist). This new version of *Petrouchka* is dazzling orchestrally, and it is a delight to hear the virtuoso Chicago Symphony romp through this vivid

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score. The light-textured engineering is far more appropriate for *Petrouchka* than it is for a Germanic symphony, and some listeners may be attracted by Levine's high-powered reading. There are many worthy recordings of Stravinsky's masterpiece, particularly the composer's own version with the Columbia Symphony. And keep in mind that Philips plans to record Colin Davis and the Concertgebouw Orchestra in this music as well as a complete *Firebird*, to add to their recent incredible disc of *The Rite of Spring*.

◎ **Stravinsky: *The Rite of Spring*. Amsterdam Concertgebouw Orch., cond. Colin Davis, Philips 9500 323.**

Stravinsky's masterpiece is often considered to be the most important orchestral music composed during the twentieth century, and for good reason. It has elemental power, unique orchestration and is music of vision, shocking the world at its premiere in Paris May 29, 1913. Just about every conductor of note has recorded it, and the current catalog boasts about two dozen recordings including one by Monteux, who conducted the premiere and the Paris Conservatory Orchestra, which is primarily of historic interest. Other worthy recordings are those by Claudio Abbado and the London Symphony, Herbert von Karajan and the Berlin Philharmonic and Michael Tilson Thomas with the Boston Symphony, all on Deutsche Grammophon. The composer's own superb performance is still available on Columbia and well worth owning, and it is rumored that Karajan and the Berlin Philharmonic are re-recording the score. This new Philips disc is, for me, the best of the lot. Davis's earlier recording for the same label with the London Symphony was much admired, but here he has an orchestra second to none, and now that the Philips engineers have mastered the art of capturing to perfection the richness and sonority of the unique Concertgebouw, the result is a magnificent disc accomplishment. I've waited for a long time for this recording. Does anyone remember the early English Decca 78 rpm set with Van Beinum and the Concertgebouw? It was remarkable, and only now, some three decades later, is this incredible Dutch orchestra making their second recording of the score, played as only they can play it. I highly recommend this recording and await with pleasure the announced, complete recordings of "Firebird" and "Petrushka" by the same orchestra and conductor.

◎ **Stravinsky: *The Rite of Spring*. New York Philharmonic, cond. Zubin Mehta, Columbia XM34557.**

Mehta, who will assume his new position as music director of the New York Philharmonic next season, recorded this performance last fall. Mehta is an old hand at this score and had already recorded it with his previous orchestra, the Los Angeles Philharmonic, for London Records. Columbia's new

Well played performance

version is not as good as his earlier one sonically. The London engineers provided a richer orchestral tapestry, avoiding the harsh stridency that mars the new Columbia. String tone in particular is disappointing on the new recording, and while the sound is well defined the harshness is hard to take. The performance itself is very well played but interpretively undistinguished. If you are in the market for a new recording of this incredible score surely the one to get is the recent Philips disc with Colin Davis conducting the Amsterdam Concertgebouw Orchestra.

◎ **Villa-Lobos: *Momoprecoce* (Fantasy for Piano and Orchestra); *Bachianas Brasileiras No. 3*. Christina Ortiz, pianist; New Philharmonia Orch., cond. Vladimir Ashkenazy, Angel S 37439.**

The vast output of Villa-Lobos is scarcely touched upon via discs, and this fine new Angel LP offers modern stereo versions of two of his more important works. Just about everyone knows the famous *Bachianas Brasileiras No. 5* for soprano and strings made famous by soprano Bidu Sayao, whose unique recording of it is available on Odyssey. Scored for various combinations of instruments mostly on a chamber music scale, the *Bachianas Brasileiras* were composed over a period of fifteen years and represent the Brazilian composer's tribute to Bach, to whom he

Bach via Brazil

was devoted. The music of Bach is seldom suggested, but the subject did result in some of Villa-Lobos's most intriguing writing. *Bachianas Brasileiras No. 3* is for solo piano and orchestra with four movements, each treating the soloist in an unexhibitionistic fashion. Much of the writing is evocative, with the final movement a brilliant Toccata. *Mômoprecoce* began life as a set of piano pieces called "Brazilian Children's Carnival" but later was rewritten for piano and orchestra at the suggestion of Brazilian pianist Magdalena Tagliaferro, who later recorded it, a disc long unavailable. This music suggests the atmosphere of the carnival with folk tunes sung by Brazilian children, recreating the atmosphere of the famous three-day Carnival that takes place in February every year in Rio de Janeiro. For me a little of this goes quite a long way, but there is no question of the caliber of the performance on this excellently engineered disc. Christina Ortiz is a superlative pianist, and while it might seem strange for Vladimir Ashkenazy to have the role of conductor, he does an exemplary job.

◎ ***Kosmos*, electronic music by Tomita, RCA Victor ARL1-2616.**

Tomita's first RCA recording, featuring the music of Debussy, was quite impressive in its own way and a best-seller for months. Three more albums followed and each was marked by a sameness of execution, a reliance on twangs and tweeps, and a general atmosphere of quixotic grotesquerie that I find does not wear well. Now on Tomita's latest, *Kosmos*, we have a conglomeration of sounds guaranteed to drive you up the wall, particularly if you are familiar with and cherish the music Tomita has subjected to his army of synthesizers, sequencers, equalizers and mixers. *Star Wars* is given a touch of whimsy that is not inappropriate, but what happens to *Also Sprach Zarathustra*, the *Ride of the Valkyries*, and other classics is quite an abomination.

◎ **John Williams: *Symphonic Suites from "Star Wars" and 'Close Encounters of the Third Kind,"* National Philharmonic Orch., cond. Charles Gerhardt. RCA Victor ARLI-2698; Los Angeles Philharmonic Orch., cond. Zubin Mehta, London ZM 1001.**

This coupling will delight space buffs, containing music from two film blockbusters that have captured the imagination of movie audiences everywhere. The score for "Star Wars" is remarkably eclectic, with strong traces of "The Planets" by Holst, as well as bits of Bartok, Prokofiev and Richard Strauss. But the main theme is brilliantly effective, and the Throne Room scene contains a march that well could have been written by Elgar. "Close Encounters" is sterner stuff, highly serial in nature for much of the time, but dissolving into a beautiful rhapsodic theme of hope. Both records should delight the audio-minded, but the RCA has the edge in brilliance, dynamic range and richness. Gerhardt, who is responsible for RCA's impressive Classic Film Score series, is as at home here as he is in Korngold, Steiner, Herrmann and other composers featured on that series, and the National Philharmonic plays for him with fantastic virtuosity. Mehta's direction is strong, but the Los Angeles Philharmonic is not equal to the National Philharmonic, and for some reason he plays only a 12-minute suite from "Close Encounters" while Gerhardt's version contains an extra 8 minutes that adds cohesiveness to the score. Mehta includes the brief Bar Room Scene music, not included on the Gerhardt recording. Both discs should enjoy enormous popularity and present Williams' music as it never sounded in the theatre. ▲

HOW TO AUDITION (JBL)

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development activities, center around refinements of existing principles, and each company sees the desirable attributes in different perspective.

In our work at JBL, we have a tradition relating strongly to both the recording and music reinforcement industries. This has thrown us into contact with the creative side of music and may give us some edge in carrying through a continuity of purpose from the recording studio into the home listening environment. Significantly, there are three characteristics of our recent bookshelf product which relate to these purposes:

1. Flat on-axis frequency response. This has been a long-standing requirement, and it guarantees the listener that the sound which arrives first at his ears will be the same in spectral terms to the sound on the record. We can take it for granted that this is a characteristic of many good speakers

2. Flat energy response. Most companies have only recently given this attribute the attention it deserves While flat on-axis frequency response provides the "leading edge," the total energy radiated by the loudspeaker has its effect a few thousandths of a second later in providing overall realism, accuracy and freedom from fatigue for long periods of listening. Flat energy response requires a careful choice of driver sizes, network slopes, and crossover points. The aim is to ensure that the effective radiation angle is maintained at a fairly constant value over most of the frequency range. Our more sophisticated monitor designs, as well as those executed by a few of the leading independent designers, have demonstrated this over several years.

3. Accurate imaging. While many multi-element loudspeaker arrays may produce ingratiating sounds, it is generally conceded that only mirror-imaged arrays of drivers can produce really accurate imaging. As recording technology and electronics have improved so dramatically in recent years, there has been a need for loudspeakers which image accurately. Our preferred approach in systems consisting of no more than three elements is that these elements be located in a vertical line. One vertical array is the mirror image of another vertical array, and this will guarantee, with proper matching of level controls, that the entire range of phantom images between the loudspeakers will be accurately and precisely delineated. The benefit for the listener is a convincing musical presentation in both the left and right aspect of stereo as well as fore and aft depth relationships on the recording stage.

Obviously, JBL is not alone in subscribing to these attributes, and their importance is felt by many manufacturers to a greater or lesser degree. In our own case, attention to these attributes represents an effort to bring the very best of our recording studio technology into the consumers' home at affordable prices. ▲

HOW TO AUDITION (Acoustic Research)

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iron plates. The voice coils don't have to move as far to get adequate sound. Crossover frequencies are kept as low as possible to avoid cone or dome breakup. More magnet and steel means more weight to the speaker. "Another general rule of thumb would be the heavier the speaker the better the sound."

Frequency Response: A three-way system usually provides an optimum frequency response. No one driver can adequately span 20-20,000 Hz so multiple units are generally set up to span the range. Two drivers (woofer and tweeter) generally shorten the range or "hole in the middle" while except for a relatively few "super design speakers," three drivers maximize the response.

The consumer should stay with brand-name products whose manufacturers have technology and a dedication to integrity of purpose. ▲

HOW TO AUDITION (Klipsch)

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What can the loudspeaker engineer do to minimize these defects? An open cone "direct radiator" loudspeaker of nominal 12-inch size will display a certain irreducible minimum level of distortion at a certain output, regardless of who makes it, what kind of a "baffle" it is in, or what kind of amplifier drives it. Above that irreducible minimum, the speaker may display higher distortion due to many structural factors—for example, the "suspension compliance" or springiness of the cone mounting may be "non-linear" which is to say that the displacement is not proportional to the force applied. A graph of cone motion plotted against applied force is not a straight line.

So, if all 12-inch cone speakers are basically alike, how can distortion be reduced? The answer is the use of a horn. The first reference to horns may be where Joshua was commanded to have the trumpets sounded during the attack on Jericho. The first analytical treatment was by Dr. Webster in 1919. The first use of a spectrum analyzer to

measure loudspeaker distortion may have been my own paper "Modulation Distortion in Loudspeakers" (Audio Eng. Soc., April 1969). I showed that the horn type speakers display at least one whole order of magnitude lower distortion than do comparable direct radiator type speakers at the same power output. In other words, a well designed horn speaker will display less than 1/10 as much distortion as a comparable direct radiator at the same power output. In Part 3 (Audio Eng. So., Dec. 1972) I showed a graph of distortion plotted against power output for 3 different speakers.

This graph has been reproduced here (Courtesy Audio Engineering Society).

Loudspeaker research, design, development, and production at Klipsch & Associates has centered around achieving minimum distortion and minimum variations in amplitude response. I have been asked what our future plans are for improving speakers. My crystal ball is cloudy, but I feel our future will be based on the past: Keep on experimenting, testing, measuring, and continuing to reduce the magnitude of defects, hopefully to the point where we come still closer to "reproducing original sound." ▲

HOW TO AUDITION (ESS)

(Continued from page 38)

difference in sound.

Audition speakers using the same (or similar) components to those you will be using. This way you have a better idea of how they will sound on your equipment. For example, a speaker that requires and is demonstrated with a 200-watts-per-channel amplifier will be disappointing if played at home with a 25-watt-per-channel unit.

Use complicated music with a wide dynamic range to test the loudspeaker. Playing a record in which a single voice or instrument is featured will only give you a clue to the performance of that loudspeaker since you are only testing it within a limited frequency range. The real test of a fine loudspeaker is how well it performs when it is required to duplicate the live performance of a full choir or orchestra. Play a number of different cuts that do this. Some key tests to judge performance are: When all the instruments are playing at the same time you should be able to pick out each of the individual instruments. Does the piano sound correct? Do you hear resonance of the keyboard? Do trumpet attacks sound forceful and biting? Do the bells ring out clearly? Are drum rolls and timpani crescendos and sudden cymbal clashes clear, sharp, thunderous?

Test the loudspeaker's dispersion by changing your listening position relative to the speakers and move to a position off to the side of one speaker (horizontally off axis to the speakers). Is the positioning of the musical instruments the same (as it should be) or do the highs drop off completely and the musicians seem to change places? When you move you should experience the same sensation as you would in changing your seat in a concert hall from the center to the side. All of these things are measures of tonal coloration, distortion, dynamic range and dispersion. If a speaker can do all of these things well—reproduce startlingly real sudden increases in loudness and sudden dynamic range without distorting, give you a sense of hearing the entire orchestra or chorus in the room while differentiating between individual instruments or voices and at the same time provide excellent dispersion—then this loudspeaker should be able to do everything else that is demanded of a fine loudspeaker.

We at ESS have dogmatically refused to accept the boundaries and limitations of conventional speaker technology. We realized that only minor improvements were possible within the confines of cone technology. Consequently we chose not merely to improve on existing technology. Instead we have set out to develop a new and better way of reproducing sound.

Dr. Oskar Heil worked with us at ESS to challenge the established concepts of hearing. By applying the principle of leverage to sound, he developed the Air Motion Transformer.

Every speaker ESS makes contains an Air Motion Transformer and is designed to reproduce live sound accurately with excellent dispersion and dynamic range. All ESS speakers are highly efficient and yet can handle enormous amounts of power. These high standards are maintained throughout the ESS line since ESS manufactures every critical component themselves, including their own drivers crossovers and cabinets. ▲

HOW TO AUDITION (Bose)

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will do your listening. Ideally, the best place is in your own home. Some dealers will lend you a "loaner" pair for a limited time. Next best would be at the home of a friend who owns a pair of speakers you are considering for purchase. Most likely, however, you will do your listening in a dealer's showroom. It is hoped that the speakers will be well placed. That is, with only two of three pairs on one wall, according to manufacturer specifications. To achieve the best acoustics, only a few speakers should be placed on any one wall.

It is possible, however, that you will be confronted with the worst kind of listening situation—a dealer showroom where an entire wall is packed floor to ceiling with rows of speakers. The salesman will play one on the floor and tell you how good the bass is.

Of course there is more bass, since the speaker is on the floor. He could also point out that it has too much bass. Or that the speaker at ear level exhibits a thin sound (chances are its tweeter is in line with your ear). Or, he could play a recording with excessive bass, which would make the ear-level speaker sound in correct balance. The extra bass compensates for the lack of bass due to placement.

In this kind of listening situation, only the grossest differences in speaker performance can be detected, and you should be aware that any resemblance to the way a speaker will sound in your living room is purely accidental.

Look for a showroom which allows a speaker arrangement similar to how speakers ought to be arranged in your living room, with as few speakers as possible on one wall, with each placed according to the manufacturer's recommendations.

Do A-B comparisons if you can. The comparisons must be instantaneous, with a push button in your hand so *you* control the switching. And, the comparison must be made at the same volume level. Even small differences in volume can make one speaker sound better than another.

Take the push button and walk around the room. You don't want to be limited to only one good listening position in your home, so the sound of your speakers shouldn't vary much as you walk around. The best of speakers will even allow you to hear the opposite speaker of the stereo pair when you are standing directly in front of one speaker. Listen for a uniformity in the quality of the sound as you move from place to place within the room.

Next, listen to a variety of recorded material. Male and female vocalists, jazz, classical, solo instruments, large and small ensembles. If possible, play recordings which your own experience has shown to be good. Bring your own records into the store, if you like. But whatever you do, don't make any decisions listening to FM broadcasts. They vary too much in quality to be reliable.

Above all, don't allow yourself to be rushed. Take your time. It takes a little while to "tune in" to a particular recording, and to a particular comparison.

What if you can't A-B? Then you can compensate somewhat by listening much longer (such as at a friend's, or with a loaner pair) to each speaker under consideration.

Now here's what to listen for. First, try to form an overall impression of the sound. It should be pleasant and natural, not strident or harsh. It should be easy and comfortable to listen to.

Do not listen to speakers played at constant high volume, since all but a few speakers will become harsh at high volume and because excessive volume will tire your ears and make you less sensitive to subtle differences.

Is the sound well balanced—that is, can you hear (as well as feel) the deepest bass as well as the detail and clarity in the middle and high tones without harshness?

Is there a natural spaciousness to the sound? Does it appear to be coming from two small areas, or does it envelope you as it would at a live performance, while preserving good localization and detail?

Now whether you like pop, jazz, rock, or whatever, the best kind of music on which to base a first impression is a fully-orchestrated classical piece.

Why? Because in this type of recording there will always always be some sound simultaneously in every part of the frequency range, and a speaker's inability to accurately reproduce any segment of the frequency spectrum will become more quickly apparent. And, a less than excellent speaker will fail to separate the complex sounds of the different sections of the orchestra.

For the next listening test, a good clean jazz or pop recording (especially some of the better direct-to-disc material) is recommended. On a good jazz recording, do the cymbals have a nice, bright tingle and edge? Is the bass solid with a good feel, while retaining detail and precision with no boominess?

Listen to vocals, since you are most familiar with the sound of the human voice. Is it too full, with too much middle bass, or is it too thin, with overemphasized highs? What you are looking for is naturalness—the most accurate reproduction of sound as you would hear it in a live performance.

The search for the right speaker system for you will take more time and care than any other component. But if you carry out the process carefully and patiently you will be rewarded with speakers that most truly please you, and which will continue to please you for a long time after you have them set up at home. And then you can share with others the secrets of being a critical listener. ▲

HOW TO AUDITION (Koss)

(Continued from page 39)

as a whole.

Assuming that the "live performance" standard of reference helps to analyze a loudspeaker's clarity, its coloration and harmonic distortion, your ears will be able to decide whether the brass section is pinched and screaming or clear and mellow, whether the highs are edgy rather than silky smooth or the bass is boomy instead of solid and tight as it should be.

We used the live performance standard as a reference in designing our CM (Computer Maximized) Series of dynamic loudspeakers. After designing stereophones for twenty years, we felt we could bring the same sound quality to loudspeaker reproduction.

Now when it comes to comparing loudspeakers, you are in the hands of your audio specialist. Remember that listening to speakers in his demo room will be most valuable when you include a sample of your favorite music. Why not bring along a recording that you know and find especially exciting and ask for a "live demonstration" of several loudspeaker systems.

Remember to listen for musical balance—precise re-creation of each instrument in its proper scale—as well as the loudspeaker's ability to represent every individual sound with clarity.

Be aware of the system's proximity to the walls and floor of the demo room. Placement is critical in tailoring —particularly the bass end of any loudspeaker—as the proximity to walls or the floor tends to reinforce bass response. Be sure that the two speaker systems you're comparing are in the same relative positions and that the amplifier treble and bass controls are flat.

You'll also find that unequal volume during A-B comparison will color your initial evaluations. Work to keep amplification variables as constant as possible.

Also remember to ask about the loudspeaker's power requirement as it applies to minimum drive and maximum efficiency. Be sure that your support system is able to deliver enough power to maximize the performance of the loudspeaker you select.

But most important of all is the development of your own "sonic language." Remember that you'll be spending hours with the sound characteristics inherent in your own loudspeaker. And that sound should be completely pleasurable. So be sure to listen critically for each instrument as it blossoms or withers and dies.

Your ears are the most critical factor in listening and perceiving music as exciting and realistic. If you are successful in choosing a loudspeaker that accurately reproduces your favorite music, it will be able to invoke the same emotional response from you as a live performance does. All musical reproduction should be exciting and stimulating, and that's what we set out to bring back alive with our "Sound of Koss." It's a sound that's really worth your own personal discovery. ▲

OPERA: RENATA SCOTTO

(Continued from page 48)

tele and Schuyler Chapin to the present Met triumvirate of Anthony Bliss, James Levine and John Dexter. Her relations were okay with Gentele, good with Chapin and excellent with Levine, who appreciates her as the Italian soprano who is best suited to carrying on the vocal tradition of the great divas of the past.

He also has seen that, though Miss Scotto can still sing bel canto heroines, her real strength is not in the high coloratura but in the more middle roles of Verdi and verismo. Her initial success in *Madama Butterfly* was not a fluke: it was precisely her repertory, and since the fall of 1975 New York has been reaping a rich harvest of Scotto performances in precisely the area that she sounds best.

In January of 1976 she undertook the complete Puccini *Trittico*, three very diverse characters, and scored a

(Continued on page 76)

resounding triumph. Moving from the sexy, slatternly Giorgetta to the saintly Sister Angelica to the nubile, naive Lauretta, Miss Scotto made each a real person and sang them magically. Her performance is now available on Columbia Records, at least of the *Suor Angelica* (M-34505) and *Il Tabarro* (M-34570). In both the record buyer can hear her intensity blazing out of the disc, with long lines of melody full of passion.

Her most famous role is still Madama Butterfly, which is available on an old disc led by Sir John Barbirolli (Angel S-36567). She was young then, and the freshness of voice as well as her unparalleled ability to phrase can't be missed. I am tempted, however, to counsel a hesitation on buying this album. The soprano is currently pressing a new *Butterfly* for Columbia which will show all the insight into the role she has gained over the past ten years. And Miss Scotto has constantly developed. Within the last year she has begun to sing high notes in the area of C and D-flat with greater ease and roundness than ever before in my experience of hearing her.

Among her recent recordings on Columbia one of the very best is a new *Adriana Lecouvreur* (M-334588). Cilea's faded nosegay lives only on the personality of its performers, and Miss Scotto, who sang the role last fall at the San Francisco Opera and for a few performances at the Met in March, interprets the role with scalding intensity and beautiful sound. Aided by James Levine's brilliant conducting, Placido Domingo's matchless Maurizio (perhaps his finest role on records) and Sherrill Milnes' excellent Michonnet, Miss Scotto spins out Cilea's phrases as if she owns them.

Giordano's *Andrea Chenier*, recorded for RCA with the same team of principals and conductor (ARL 3-2046), is not as successful. She sings well, but the role demands a spinto, more of the weight of Renata Tebaldi, and at crucial moments she sounds overtaxed. She has not sung the role in the theater, and one wonders if she will.

From the period of the last decade several recordings are particularly outstanding. Her *Rigoletto* (DG 2709014), with Dietrich Fischer-Dieskau and Carlo Bergonzi shows what a wonderful role Gilda can be if sung by a lyric and not a coloratura soprano. Toscanini, of course, wanted a dramatic soprano for the role—and used Zinka Milanov, for his famous Act IV Victory Bond Rally performance at Madison Square Garden, but there is no question that the role is set for a Verdi voice, not a light coloratura. Miss Scotto gives it its weight and pathos, making the duet in Act III memorable as is the whole last act. It is one of her finer performances.

Fine, too, is her *Lucia di Lammermoor*, now on Everest (439/2) although some high notes are troublesome, and her brilliant Liu to the *Turandot* of Birgit Nilsson and Calaf of Franco Corelli (Angel 3671) is a moving, heartbreaking performance.

Of her recital discs her first on Columbia, called *Verismo Arias* (33435) is a knock-out. On it she handles Puccini with deftness and shows wonderful rapport with some of his less well known contemporaries. Her voice sounds powerful, radiant and always persuasive.

In writing about Miss Scotto, the future is more interesting than the past. Soon there will be a *Nabucco* on the market, a Verdi Requiem, the aforementioned *Butterfly* and who knows what else. The crucial factor about her is the expressivity of her voice, its ability to leap off the record and bring the listener into the time and place of the performance. This is an unusual trait and one that on her commercial records even Miss Callas sometimes lacked.

It may well be that the recording processes have improved over the past 20 years, but other singers such as Renata Tebaldi, Birgit Nilsson and Leonie Rysanek have not proved "phonogenic." Their records do not capture the real magic of what it was (or is) like to enjoy them in the opera house.

Witness Miss Scotto's recent *Adriana* and *Tabarro* recordings for the opposite. What she is on the stage comes over blindingly through the phonograph, and the consumer is by far the richer. For many reasons she deserves to stand at her position at the Metropolitan Opera, and the record-buying public is far richer for her consequent, frequent exposure on disc. ▲

SOUND PROBE (Acoustic Research)

(Continued from page 22)

where nothing melts. The speaker can thus absorb more wattage and project louder sound without disintegrating.

Originally developed for big discotheque speakers, liquid cooling now also enhances the capabilities of small speakers, allowing them to handle higher power without overloading. A single tweeter can now take signal levels that formerly would have required costlier designs with multiple tweeters or separate midrange units to spread out the load. That's how the AR-18 manages up to 60 watts of program material per channel.

Even so, the little speaker loses just a trifle of its commendable clarity when it's working too hard—for example during an orchestral fortissimo played close to concert volume. For this reason, Acoustic Research recommends the speaker mainly for rooms with less than about 2000 cubic feet of air volume. At any volume level needed for such moderate-size rooms, the sound of the AR-18 stays natural and lucid. In such rooms, as little as 9 watts from the amplifier will drive the speaker to realistic loudness levels, though the manufacturer recommends amplifiers or receivers rated between 15 and 30 watts per channel.

To sum up, here is a small speaker that succesfsully impersonates a much bigger one. At a list price of $65, the AR-18 is proof that—if you pick the right components—the price of good sound is coming down. And that's quite a feat in these inflationary times. So, if you're short on cash, space, or both, the AR-18 is an undisputed bargain and one of your best bets. ▲

SOUND PROBE (Bose)

(Continued from page 22)

upward or toward the rear. But the combination of forward and sideways sound thrust by itself produces a most impressive gain in spaciousness.

The sound itself is thoroughly enjoyable, though it took a little fiddling with the tone controls on the receiver to get the balance to our liking. With the tone controls in flat position, the 501 sounded as if bottom lows and top highs were predominant at the expense of midrange—a rather dramatic sound that can be most effective for jazz and rock. In the absence of a tweeter-level control on the speaker, we tamed those bright highs with a slight downward nudge on the treble control on the receiver, and a very small amount of bass boost brought up the middle lows without overstressing the bottom. That way, we attained an overall balance that made all kinds of music pleasurable and convincing. Setting the tweeters at an angle of about 45 degrees created an impressive sound spread for choral and orchestral works, and to our surprise we found that we also liked it for small jazz combos, though at times it made the stereo location of individual players a bit uncertain. Only for clas-

sical solo vocals (Lieder, arias, etc.) did we point the tweeters directly forward, so the vocalist wouldn't seem stretched sideways.

The manufacturer recommends a minimum of 20 wpc to feed the 501 and recommends putting a fuse in the speaker line if you're using an amplifier stronger than 50 wpc. In our tests, the speaker handled plenty of power—including organ music at window-rattling volume—without audible signs of distress. In sum, the Bose 501 is a highly capable speaker whose special design features will especially appeal to listeners relishing the "space effect" created by the variable pattern of sound reflection. ▲

JAZZ

(Continued from page 18)

cadential straightforwardness of Jimmy Blanton or Ray Brown; his sound is more appealing than Gomez's. The problem every bassist has in this group is an excess of solo space, but if Moore's improvisations, as sampled at the trio's debut in a New York club, were satisfactory without being inspiring, his accompaniments were strong, equanimous, and lovely. On a performance of "Emily," which Evans played in a tense, single-noted style, Moore's phrases rang with individual, complementary melodies—empathetic but self-contained despite the gathering fury in Evans's solo. Jones is a precise, startling drummer who propels Evans with volatile entrances after the pianist's rubato introductions, by varying the turnbacks, and by alternating the oblique rhythms favored by Evans with a forthright 4/4. His momentum is constant and his brushwork suave.

The emergence of this edition of the trio is especially propitious in light of the new Evans records—*Alone (Again)*, a considerable disappointment, shows that Evans needs a fresh, challenging setting. The album's overlong perorations lean heavily on thematic repetition for continuity, and there is little of the sustained feeling that characterized his earlier recordings of "The Touch of Your Lips" and "Make Someone Happy" (both on Verve and now out of print). The disastrous "People," a failure more in concept than execution, is a 14-minute out-of-tempo theme recitation pounded with a Lisztian ardor unjustified by so limited a melody. *Quintessence* is far more successful, largely for the rhythmic support of Jones and Ray Brown, whose simple, earthy, pre-LaFaro note choices provide a winning tension in the context of Evans's diaphonous chords. On "Second Time Around," he goads Evans into an unexpected rhythmic panache. Moore and Jones could have the same effect and the addition of new material in the trio's books—including Jimmy Rowles's "The Peacocks" and "Theme from M*A*S*H," which Evans has reharmonized so effectively it sounds like an original—can only help.

Evans's past is also unfolding before a new audience, as Milestone continues to reissue the series of records he made for Riverside in the late '50s and early '60s; they established his reputation then and help sustain it now. His most influential trio, with Motian and LaFaro, can be heard on *Spring Leaves* (M-47034), where the bass-piano interplay becomes a rea'ity, especially on "Blue and Green"—a sequel to Miles Davis's seminal *Kind of Blue* (Columbia 8163). The group's most impressive work, however, is *The Village Vanguard Sessions* (M-47002), recorded shortly before LaFaro's death in 1961. The earlier trio with Philly Joe Jones (1958) was repackaged with an uneven, previously unissued quintet session (including Jones, Ron Carter, and Zoot Sims) on *Peace Piece and Other Pieces* (M-47024). Evans retired for a few months after LaFaro was killed in an auto accident; his 1976 recordings, with Chuck Israels on bass, are heard on *The Second Trio* (M-47046). A 1963 trio date with Gary Peacock—Paul Motian had been the constant drummer since 1959—is combined with an album of duets with guitarist Jim Hall on *Trio, Duo* (Verve VE 2 2509), although his two outstanding Verve albums, *Town Hall Concert* and *At Montreux* are unavailable. His best recent recordings are *The Tokyo Concert* (Fanstasy 9457), *Since We Met* (F 9501), *Montreux III*, (F9510), a duo concert with Gomez, and *Quintessence* (F 9529). Evans has also been heard with George Russell's large orchestra, a more experimental context, in 1958, *New York, N.Y.* (MCA2-4017), and 1972, *Living Time* (Columbia KC 31490). ▲

SUPER RECEIVERS

(Continued from page 41)

twice the set's rated amplifier power during transient music peaks, so these are, 100, 150 and 400 wpc units.

JVC is the bellwether receiver manufacturer featuring what is generally an add-on audio product—a graphic equalizer. Appearing in at least four JVC receivers, this feature permits individual adjustment of five frequency bands, to "tailor" sound to individual room environments.

Kenwood's new Model KR-6030 features a power supply that feeds separately through individual rectifiers into the pre-driver stages and the power stage, to improve dynamic range (particularly in the lower frequencies), and assuring exceptional clarity of reproduction.

What may turn out to be a trend is the use of LED indicators in receivers to show power output readings. Possibly the first company using LEDs for this purpose is Lux in its three receivers, the 40 wpc R-1040, the 50 wpc R-1050, and the 120 wpc R-1120. Each of the above uses 12 LEDs, six for each channel.

A built-in oscilloscope is used by Marantz in its 250-wpc Model 2500 ($1750) for providing "the most accurate means of tuning indication, signal strength and FM modulation." In addition, this exclusive signal analysis system provides a precise indication of multipath rejection, stereo separation, phase relationships, and turntable rumble or feedback. (Multipath indicators are also used in the Fisher Model RS1080.) Marantz keeps the size of the 2500 to reasonable dimensions and its weight down through the use of a proprietary turbo-flow heat dissipation system—derived from its Model 510 professional power amplifier, and the use of "pin-fin" heat sinks. Another feature is a connection for an optional plug-in Dolby FM decoder.

A microphone input with mixing control is a key feature of Nikko's top-of-the-line Model NR-1415 ($850), a 175 wpc set that also features two-position tape dubbing and a pop noise cancellation circuit that eliminates potentially speaker-damaging clicks and thumps heard when a set is turned on. Sanyo's new 120 wpc JCX2900K ($570) also features microphone input with mixing.

Quartz-locked tuning, which senses and corrects frequency deviation (drifting), was first offered in receivers by Onkyo in its TX-4500 ($449.95), and later in its Model TX-8500 ($699.95). Now Pioneer is offering quartz-locked tuning in its new 270 wpc SX-1980. This tuning circuit monitors the difference in phase between a high quality reference signal generated by a quartz crystal and the local oscillator to main-

tain zero phase difference, to prevent station drift, provide maximum channel separation, and minimum distortion. This is a feature you'll be seeing in a few more models before year's end.

If you aspire to be a disc jockey, Optonica provides that opportunity via two phono inputs in its 85 wpc Model SA-5151 ($500) and 65 wpc Model SA-4141 ($400). This allows two turntables to be connected simultaneously for added versatility and special disco applications.

Philips in its Model AH787 ($500) offers complete loudspeaker protection via an electronic circuit that immediately disconnects the speakers should abnormal DC voltages occur at its output. Thermal protection is accomplished in the firm's AH786 ($400) by thermal sensors that shut off the power when they detect overheating of the output transistors in either or both channels.

The "component-look" which is manifest in the use of "handles" located at each end of many separate components, has come to receivers. If you want that sort of look, check out the Rotel line where you'll find five such models, and the Setton line, which features three.

The component look in another aspect, black finish, is available to you in the receivers of a newcomer to the field in the United States, Sankyo. It comes in the firm's Models SRC-4040BL and SRC-2020BL. You'll also find black receivers in the Optonica line.

All three models in the Setton line feature a "security panel." This area of the front panel contains a clipping indicator for the power amplifier, overheat of the heat sink and speaker protection indicators.

Sherwood is proud of its receivers and wants owners of them to be too. So it has inaugurated a "Certified Performance" program. Purchasers of a new Sherwood receiver get a notarized document attesting to its individual peak performance characteristics, in addition to a limited three-year warranty on parts and labor. All "CP" sets are lab-tested to ensure performance that matches or exceeds advertised specifications.

Built-in Dolby circuitry for Dolby-ized broadcasts are a feature of Sony Models STR-4800SD, 5800SD, 6800-SD, and 7800SD. A stereo system containing the top-of-the-line STR-7800SD receiver is protected from excessive current and heat by a triple protection circuit and a heat sink temperature sensor that automatically shuts off power when temperatures exceed operating tolerances or when a speaker-damaging DC potential appears at the output.

Superscope Models R-1240 ($209.95) and R-1270 ($279.95) feature "Quadraphase." This circuit, in conjunction with two additional speakers, produces simulated four-channel sound from two-channel stereo recordings.

Tandberg's $1,200 Model TR-2075 ordinarily comes in a quality rosewood cabinet—rare in the receiver field. Now, in response to requests, this set is being offered in a clear lucite cabinet, so that you can proudly show off its complex interior. Another nicety of this full-featured model is a power reading switch that permits the signal strength meter to be switched to perform as a power-reading instrument. It also has *three* tape outputs.

Two phono inputs with impedance selection, two tape monitors with two-way dubbing, protection circuits with overload alarm and variable-turnover click-stop controls are key features of the Technics Model SA-5770 ($799.95), top of that firm's seven model receiver line.

Toshiba's 100 wpc SA-7100 features a split panel for a component look that is further enhanced through the use of four meters—two for tuning, and two for power level indication. The lower panel contains a hinged subpanel that hides less-often-used controls.

Three meters are used in the top model of the Yamaha line, CR 2020 ($750). One is an FM tuning meter. One is a power meter. The third is a combination that can combine with the power output meter to show the output level of both channels, or be switched to serve as a signal strength and signal quality indicator. In the latter mode it will also indicate multipath interference. ▲

SPEAKER SPECIFICATIONS

(Continued from page 27)

placement within the room, and this placement is clearly spelled out in the owner's manual. The majority of speaker manuals take a more cavalier attitude and suggest you experiment with placement. Indeed, you should.

The deep bass response is augmented by reflection of the sound from the closest surface. Hanging the speaker from a sky hook in the middle of the room produces the least bass. (It's likely to be the smoothest bass however.) Resting the speaker on the floor in the middle of the room, or placing it against the middle of a wall, provides one reflecting surface and produces somewhat greater bass. Situating the speaker against two intersecting reflecting surfaces—say at floor or ceiling level, against a wall—further increases the lowest fundamentals, and locating it in a corner at floor or ceiling level ups the bass some more.

The problem with this reinforcement process is that it is not uniformly effective at all frequencies. As long as the woofer is a very short fraction of a wavelength away from the reflector (as it is at the lowest frequencies), the reflected sound is in phase with the direct sound and serves to augment the total output. At higher frequencies, where the wavelength is shorter, the relative phase changes, and, at some frequencies, the two waves are out of phase and cancel. Thus, in a room, the response ripples across the band even though the speaker may test well in "free space." In general, the speaker should be placed so that the woofer is not equidistant from the various reflecting surfaces. You don't want all the cancellations to line up at the same frequencies.

Reflections occur from all of the "far walls" as well. In fact, once the sound is out of the box and into the room, it bounces around in its new-found freedom. Standing waves are set up within the room. These are stationary patterns of relative reinforcement and cancellation. Normally, the wave radiates smoothly outward into free space so that the listener's position is uncritical except for a general and continuous decrease in level the farther away you get. In a standing wave situation, moving back from the speaker can actually intensify the loudness of a tone.

Standing waves are set up only at particular sets of frequencies. These are determined by the dimensions of your listening room and are mostly confined to the bass and midbass. Nonetheless, the response is not only erratic when standing waves are present, but the response depends upon where the listener is seated. The best way to minimize standing waves is to avoid parallel walls in the room. (Did you ever see a concert hall with parallel walls?) Cathedral ceilings help. So do any other protrusions or openings that break up the symmetry. In a conventional "rectangular-box" room, it's best if the three dimensions bear no integral relationship to each other. That, at least, keeps the standing wave patterns from having common frequencies of reinforcement and cancellation.

So far, we have been talking of the effect that the room has on low-frequency tones. It also affects the highs. A room that is stuffed with plush fur-

LITERATURE LIBRARY

201. There are over 400 kits described in the new *Heathkit* catalog for virtually every do-it-yourself interest—amateur radio, hi-fi components, color TV, test instruments, digital clocks and weather instruments, radio control equipment, marine, aircraft and auto accessories, and many more.

202. *Electro-Voice* will send complete information on Thiele-Small parameter speakers and systems which combine flat, wide response, high efficiency, and small size (to half size of sealed systems) including Interface and Sentry systems. There's also information on new separate component speakers.

203. *Crown* offers a new four-color brochure illustrating and describing the company's complete line of hi-fi amplifiers, preamplifiers, speaker systems, control centers and tape recorders.

204. *Sony's* "High Fidelity Components" has a glossary defining major specification, control and convenience feature terminology, which complements the reference chart of specifications for components.

205. The new 20-page, full-color stereo-phone catalog from *Koss* features lively photography and art to show 15 of the company's dynamic and electrostatic stereophones and listening accessories. There is a specification comparison chart and prices.

206. *Kenwood's* wide range of receivers, amplifiers, tuners, tape decks, stereo compacts, and speakers is described in a new brochure.

207. The full range of *Magnavox* audio products from the tuner/amplifiers to combination stereo FM/AM radio phonographs and 8-track tape player/recorders are featured in this new 60-page four-color audio catalog.

209. *JBL's* brochure describes the Decade "family" of loudspeakers: the L26, the L16 and the L36. Each system features styling, hand-craftsmanship, and sound quality, yet is priced for the budget-minded. Their enclosures are finished in natural oak.

210. *Klipsch* loudspeaker systems are attractively presented, including explanation of the Klipschorn corner horn and corner mirror effect. Available for a few dollars are reprints covering design, stereo re-creation, etc.

211. "Hearing Is Believing," a booklet from *ESS, Inc.*, has a serious theme and a constructive purpose. Fundamentals of loud-speaking technology are examined. How to develop a superior loudspeaker is spelled out.

213. *Pickering* has attractive specification sheets on stereo headphones. Also offered is a colorful brochure on cartridges in the UV-15, XV-15 series, as well as the V-15 Micro IV series.

216. For tips from leading sound engineers, send for "The Music-Maker's Manual of Microphone Mastery" from *Shure*. It describes how to match voices and instruments.

220. This full-color booklet by *Dynaco* is subtitled "High Fidelity Components for the Audio Perfectionist." There are two introductory articles to help you choose your component stereo system. Following is detailed information on the components.

221. A new series of product literature is now available from *Jensen Sound Laboratories*. The new catalogs feature four-color photographs and graphic illustrations of the high fidelity line.

222. *TDK* has a new booklet, "SA . . . a new state of the cassette art," in which they claim great things: much lower noise levels, greatest dynamic range, unexcelled frequency response, high precision, among others. So send for the booklet to see if you agree.

223. *Technics-Panasonic* has a complete condensed catalog of its line of stereo and 4-channel receivers, separate amplifiers, turntables, tape decks, speakers, separate tuners, microphones, headphones, integrated amplifiers, and CD-4 4-channel demoderators.

224. Before you purchase your hi-fi equipment, read "The *Garrard* Guide," what every hi-fi shopper should know about Garrard automatic turntables. There are 11 pages of information and pictures.

225. As part of a broad educational campaign, *Sansui* is making available a booklet, "A Non-Technical Guide to QS 4-Channel Sound," for the consumer. It describes the various forms of 4-channel, their advantages, disadvantages and availability of material.

227. *Tandberg* has an attractive color booklet displaying its tape decks, cassette deck, receivers, speakers and accessories.

228. *Pioneer* value-packed receivers are gracing more and more living rooms as audiophiles turn on, and tune into, the quality sounds of *Pioneer*. Circle, the number 228 and let *Pioneer* do the rest.

230. Make your own evaluation of why *Acoustic Research* (AR) components, designed basically for home use, are often selected for critical professional and scientific applications.

231. *JVC* offers three catalogs—"Tape-it-Live" is in English, French and German and features portable stereo cassette deck and accessories. "Listening for the Future" is all about the JVC FM/AM stereo receiver series. The "JVC High Fidelity Catalogue" is a 36-page full-color delight.

232. *Sherwood Electronics Laboratories* has literature available on its full line of receivers, amplifiers, and tuners. Included are specifications and independent reviews.

233. In "Meet the Creator," *TEAC* invites you to explore the realm of musical creativity with the TEAC 3340 4-Channel Simul-Sync Tape Deck. The booklet introduces some of the basic effects that can be produced, using ample diagrams.

237. The 32-page *Pioneer booklet*, "How I Install Car Stereo," by a 26-year-old expert who has installed nearly 5000 car stereo systems, shows in detail how to mount, wire, troubleshoot and maintain hi-fi in your automobile.

238. *Fuji* has just made available a new booklet on their tapes—"Cassette Tape and How to Make It Work for You." It is written on a non-technical level and contains practical information on the selection and use of cassette recorders/players.

241. *Allison* loudspeaker systems claim to be unique in producing in real-room environments. This booklet on their models One through Four explains in quite some detail how they work. Each system is pictured alongside its specifications.

242. A new four-color brochure from *VOR* describes in detail the inner workings of the patented automatic "dry" vacuumn record cleaner—the Vac-O-Rec. It cleans by lifting dust and dirt with mohair brushes, and a fan blows them away.

243. A new 12-page catalog from *Quam-Nichols* lists 127 loudspeakers, covering virtually any application and providing a tool for selection. It includes listings for new mobile 2-way radio replacement speakers—CB and land mobile business.

244. *Beyer Dynamic's* full-color brochure presents their large assortment of dynamic microphones and headphones. They claim to have the right headphone for every job—monaural, binaural, 2- or 4-channel listening, hi-fi equipment, receivers, televisions and dictating machines.

245. *Celestion* speaker systems are created in England, but are now being made available throughout the world. Send for this brochure to see why they claim such excellence in the speakers they conceive, design and produce.

246. *B&F Enterprises'* Truckload Sale catalog features 10% off their already low prices. All merchandise is high-grade military or industrial surplus: speaker kits, TV games, computer terminals, tools, TV components, lenses, transformers, semiconductors, and more.

247. *Ace Audio Co.* offers a short form catalog of kits and wired units. Pictured are preamps, equalizers, and amplifiers. Descriptions and specifications aid you in making your choices.

248. *NCI Premium Distributors* has a completely illustrated 165-page wholesale price catalog for $4. Send for information on how to get this display of all major brand radios, televisions, stereos and appliances.

249. Send for information on *Dubie's* Recording Control Systems with mixing, fading, and monitoring controls. Special features and capabilities are described, and specifications listed. Check their customer satisfaction guarantee and the one-year warranty.

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niture and rugs quickly absorbs high-frequency energy. A bare-floor, hard-walled room that is furnished with thinly padded modern furniture is much brighter—perhaps too bright. Your recourse in either case is to adjust the crossover lever controls on the speaker and/or to adjust your tone or graphic-equalizer controls.

The point of all this is that, regardless of how the manufacturer measures and specifies frequency responses, regardless of how honest and accurate that spec may be, you cannot expect to find it to be a true description of the speaker's response in your home. You must get that speaker into your listening room to find out what you've got.

Efficiency, Power Handling and Distortion. Some manufacturers specify efficiency and distortion. Almost all indicate the power-handling capability of their product. Here too, there are many approaches. Efficiency may be indicated as a percentage—in which case it tells you the fraction of the input electrical energy that is converted to acoustical energy. Few manufacturers follow this technically unambiguous method. Most tell you the sound-pressure level (SPL) that is set up at a given distance from the speaker (usually 1 meter) with a specific electrical input-power level (usually 1 watt). Others flip the coin over and tell you the electrical input in watts required to set up a specific sound-pressure level (usually 94-dB SPL) at a specific distance (again, usually 1 meter).

When comparing these figures, you must be certain to compare apples with apples and oranges with oranges. Not only must you be sure not to confuse the two sides of the coin, but you must be sure that the distances are the same, and that the input-power levels (or output sound-pressure levels) are common.

Equally important, although frequently not clearly disclosed in the spec, are the measurement conditions. Some manufacturers specify the "on-axis" efficiency, that is, the efficiency as measured at a single point directly in front of the speaker. Presumably, this is done in free space. Others specify the average omnidirectional efficiency in terms of the average power radiated in all directions. Some specify the efficiency at a single frequency; others with a pink-noise input that covers the whole spectrum. So even with a "simple" spec such as efficiency, comparison between products is not simple.

When interpreting the efficiency spec, remember that, for a common measurement method, the less power required to achieve the same sound-pressure level, the greater is the efficiency. And, similarly, the greater the sound-pressure level for a given input, the greater is the efficiency. Efficiency *is* important. You can easily pay more for a double-power amplifier than you save by buying a speaker of 3 dB lower efficiency.

Some speakers carry no efficiency rating as such. Instead, a "minimum recommended amplifier power" is specified. This is certainly a nebulous concept. How much power is required depends upon the size and furnishings of the listening room and upon the musical preferences—especially as regards loudness—of the listener. How can a manufacturer anticipate that and specify a minimum power? Unless you confine your listening to background level in the bathroom—in which case you probably don't even need as much power as his minimum—it's probably safer to assume he has underestimated your requirements.

People often ask how much power can be put into a loudspeaker. Again, no real answer is possible. On a continuous sine-wave basis—the way a power amp is rated—a loudspeaker will burn up at high output levels. The woofer of a good system may take 100 watts for a while, but it's unlikely that the tweeter can stand that kind of treatment. Music may be composed of sine waves, but it's not a sine wave itself. The power is spread over the spectrum and so is shared by the various drivers. No one gets it all except under pure-tone test conditions. Fortunately, in music, there is less power at the higher frequencies than at the lower ones so that the delicate tweeter is naturally protected under normal conditions.

Whereas a speaker may not be able to accept a couple of hundred watts on a continuous basis, it may be able to handle transient peaks. Most speakers therefore bear a "maximum recommended amplifier power" spec. This is based upon typical music conditions. Never try to pump a sine wave through at that level. Most speaker manufacturers tend to be conservative regarding their maximum power recommendation. (They don't want the speaker back for warranty service because it's been cremated.) Although it is possible for a malfunction in the amplifier to take out the tweeter even if the amplifier's power capability does not exceed the recommended maximum, this is not likely to happen under normal conditions. Installing a fuse to the speaker is also a good idea. Some speakers are already fused. Others have recommended fuse ratings. Generally, you can exceed the recommended maximum power rating *provided that* the speaker is fused, and you do not demand full power from the amp. (Obviously, you do so at your own risk.)

The distortion specification of a loudspeaker is tricky. It strongly depends upon level and upon frequency. The louder the sound, the greater will be the distortion. And usually, the distortion in the lower registers really takes off as the power is increased. Few speakers can approach a 100-dB SPL (at 1 meter) at a frequency of 30 Hz with less than 10% distortion.

A Word Of Advice. Without a universally accepted set of measurement standards such as those that exist elsewhere in the industry, speaker specs come out as a mixed bag. My advice to you is to study the literature carefully, taking the above mentioned points into consideration. Then, place it on the coffee table and *listen* to the speaker, preferably in your own home. Trust your ears, not your eyes. ▲

HEADPHONES

(Continued from page 35)

lation. After a while, it gets pretty hot and clammy in there, and your ears may feel like they're in the jungle.

While sealed headsets may not be the best choice for everyday continuous listening, there is one application for which they're essential. If you do live recording right out in the audience (without a control room), you want to be able to hear what the microphones are picking up and what has been recorded (via a monitor head) without the confusion caused by the direct sound. A good circumaural seal is essential to keep out this direct sound and let you concentrate on what's going on that tape. If you wear glasses, you may even have to take them off to assure a perfect seal.

For long-term music listening at home, the open-back type of headphone is probably a better choice. As the name implies, there's no attempt made to seal off the ear. The drivers merely rest near the ear on some sort of pad or foam buffer. Your ears can breathe, and, since there's no need to maintain a seal, the headband pressure can be quite small. You can also carry on a conversation without removing the phones (although your partner may have to shout to be heard over the music.)

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HI-FI STEREO BUYERS' GUIDE INDEX TO ADVERTISERS

Buying a Headphone. When you go to buy a set of earphones, there are three points to keep in mind: sound quality, comfort, and convenience. Unlike the case with a loudspeaker, you can accurately decide whether or not you like the sound of a headset right in the showroom. You needn't bring them home to try out; room acoustics can be ignored. The phones may not sound the same to you as they do to me for ears vary in their acoustics, but they will continue to sound the same to you for as long as you maintain your hearing. (As with a loudspeaker, specs are fairly meaningless. There's no agreement on the proper way to measure an earphone. It's best to listen and then to decide for yourself.)

Comfort is very important. If you're going to wear these things several hours at a stretch, they'd better fit. And heads and ears vary. A person with a large outer ear may find that there is insufficient room within a small earcup for him to comfortably wear a particular set of phones. Although the headband and earcup position is usually adjustable to accommodate heads of different sizes, all earphones are not designed with the cup pivot at the correct point for each person. The cup must position itself against your ear if it is to be comfortable. And, the headband pressure must be sufficient to keep the headphone in place as you move about, but not so tight as to give you a headache. Again, try them on and see if they're comfortable for *you*.

In the area of convenience, look to the length of the cord, whether it's coiled or straight, its flexibility, and the security with which the phone jack is affixed. There should be some strain relief at both ends of the cable so you don't rip up the wiring if you move suddenly. You might also check whether the pads are replaceable and how they can be cleaned.

Some phones have individual level controls at each earpiece. These can provide a convenient means of balancing the channels or of adjusting the volume from your chair. They take on added importance if two or more sets of phones are to be used simultaneously. Each listener can then set his or her own listening level.

If you've never listened to stereo on a headset, you've got a new experience coming. Spend some time in the store getting acclimated to it. Rather than having the stage spread out before you, it's spread out within and (seemingly) above you. When you move your head, the images don't appear to shift in a compensatory manner. They stay in the same relationship to your head (but not in the same relationship to your surroundings.) Your eyes and your ears feed different sensory impulses to your brain, and the results can be exciting. Headphones may not be for everyone, but you'll never know if they're for you without giving them a whirl. ▲

SPOTLIGHT ON: REVOX

(Continued from page 32)

track only.

Three DIN connectors on the rear permit instant application of three optional accessory circuits. The first is a variable speed control that permits a coarse variation of ±7 halftones, or a fine variation of ±1 halftone. Only the speed of the tape is affected by the controller; there is no change in equalization. Thus, if broad speed changes are made, expect a slight digression from the normal frequency response. The remaining optional accessories are a remote control unit and a slide projector synchronizer.

Through selection of the input sources, it's possible to obtain echo, and overdub effects.

There is not much else that can be said about the Revox B77 because its forté is performance, not features. The unit we tested was supplied factory-adjusted for Scotch type 207 tape and delivered notably excellent performance at both speeds. The usual test measurements can be found in the test report elsewhere in this issue.

The one thing a test or measurement cannot show is the subtle cleanliness of the B77's sound quality. For example, in this day of noise reduction systems a signal-to-noise ratio (wideband) of −51 dB or −53 dB is not spectacular. But the B77 sounds to the ear as if it is much more quiet than actually measured. On a spectrum analyzer the noise appears to be over a broad spectrum, rather than predominantly in the frequency range to which the ear is most sensitive. Regardless of the way in which the effect of ultra-low noise is attained, the fact remains that the high frequencies are not "colored" by a noise reduction system because there *is no* noise reduction system to start with. The sound from the B77 is remarkably clean—particularly in the upper highs, a problem area when using simple noise reduction systems.

At $1195 the Revox B77 is by no stretch of the imagination a "budget" or "moderate-priced" recorder. As with all things in life, if you want quality you must pay for it. In the B77 quality means sound quality, and you get every penny's worth out of the B77.

For additional information circle No. 86 on the Reader Service Card. ▲

THE JVC CASSETTE DECK.

It gives you more of what the others wish they could.

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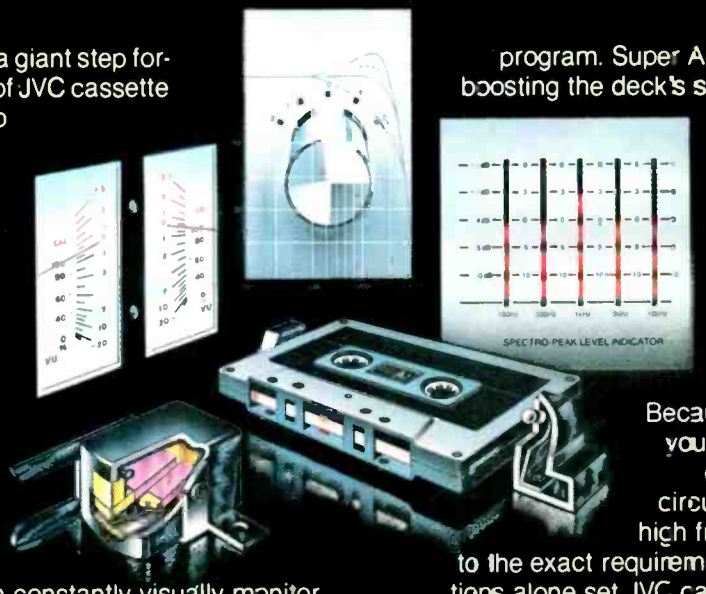


Expanded Dynamic Range and Better Noise Reduction. Our Super ANRS circuitry applied compression in recording and expansion in playback to improve dynamic range at higher frequencies. So distortion is eliminated in sudden high peaks of any musical program. Super ANRS also reduces tape hiss by boosting the deck's signal-to-noise ratio by as much as 10dB over 5000Hz.

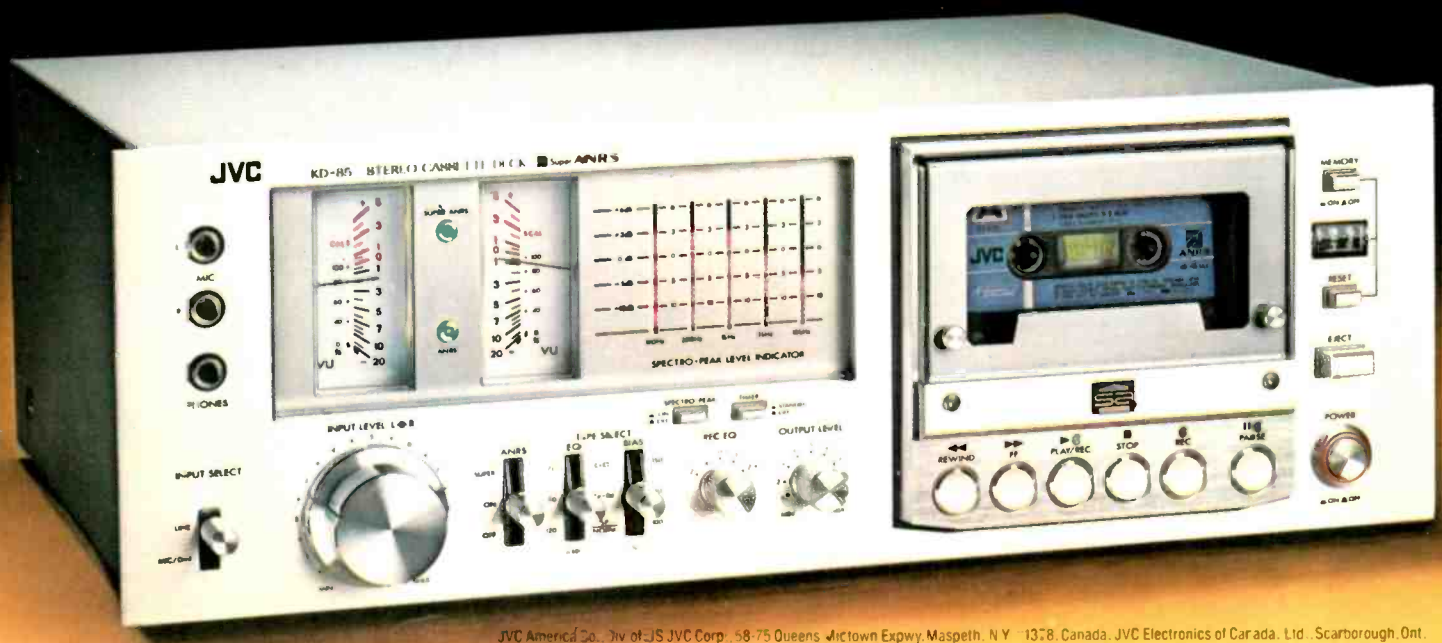
New Head Design. Our refined Sen-Alloy heads give you the sensitive performance of permalloy head construction, combined with the extreme longevity of ferrite, for bright, full-sounding recordings.

Get the most out of any tape Because whichever type you select, you'll extract the most from it with our special recording equalizer circuit that lets you "fine tune" the high frequency response of the deck to the exact requirements of the tape. These innovations alone set JVC cassette decks apart from all the others. Then, when you consider our other refinements, like precision-ground capstans, gear/oil-damped cassette doors, multi-peak LED indicators, independent drive mechanisms, plus top performance specifications, you can understand why we say that JVC gives you more of what other decks wish they could. Visit your JVC dealer and you'll hear why.


Not all features in all decks.

JVC

We build in what the others leave out.



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And just for the record, the SA-1000's phono equalizer gives you everything from a super-high S/N ratio of 97 dB (10 mV, IHF A). To a phono input that can handle a 300 mV signal at 1 kHz.

On FM you'll get outstanding specs plus two RF stages with low-noise, 4-pole, dual-gate MOS FETs, Technics-developed flat group delay filters and a Phase Locked Loop IC in the MPX section.

FM Sensitivity IHF '58	Stereo 50 dB*	FM Selectivity	Stereo Separation at 1 kHz
0.9 μV	36.2 dBf	85 dB	50 dB

*IHF '75 standard.

As good as all that sounds, Technics Acoustic Control makes it sound even better, because it adds low and high range boost and filter switches which vary the way each tone control performs at a particular setting. There's also a midrange control with a variable center frequency. And 24 LED peak-power indicators that let you keep an eye on what your ears will hear.

The Technics SA-1000. In the world of receivers, it bats 1000.

A few receivers give you 0.03% THD. Only Technics gives it to you with 330 watts per channel.

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