

IMPROVE
YOUR SYSTEM

CC 02367

MARCH-APRIL 1979 \$1.35

hi-fi stereo

BUYERS' GUIDE

CASSETTE DECK FEATURES

BUY THE ONES THAT WILL MAKE A DIFFERENCE TO YOU (see page 33)

WHICH
BLANK
TAPES
ARE
RIGHT
FOR
YOU?



FDM02FPLE1380 DB-0 01 16NOV79
FRED D. AMOUR
138 PLEASANT ST
AUBURN ME 04210

RECOMMENDED CASSETTE DECKS: LAFAYETTE LR-120Db
AN/KARDON hk670 · PIONEER SX-780 ·
C STA-2100 · SAE R3C · SETTON RS 440
RECOMMENDED AMPS: HITACHI HA-5300 · SAE C3A
OD KA-5700 · ROTEL RA 2030
RECOMMENDED AMPS · PREAMPS · RECORD PLAYERS · EQUALIZERS
RECOMMENDED CASSETTE DECKS: AIWA AD 6900U · TEAC C-1 ·
FISHER CR5150 · LAFAYETTE RK-D150 ·
MITSUBISHI M-T01 · ROTEL RD-2200 · SANKYO STD-1850
.....and many others



Select what you want in a record cleaner.

Convenience in use and storage.

You shouldn't need a separate shelf, elaborate motions or an act of Congress to clean your records. A comfortable, hand-held instrument that works best on a rotating turntable is ideal.

Effectiveness against micro-dust.

Tiny, invisible dust particles hide in delicate record grooves and can be ground into the vinyl. Only a slanted (directional) fiber using special ultra-small fiber tips can scoop up, rather than rearrange, this micro-dust contamination.

Effectiveness against chemical contamination.

Fingerprints and vapor-borne oils will deposit into channels of a record groove. Such contamination hides from adhesive rollers and all dry cleaning systems. Only a special fluid plus micro-fibers can safely remove such audible, impacted deposits.

Total removal of contamination/fluid.

Capillary action—the lifting of fluid by small fiber surface tension—is totally effective. You want to get contamination off the record, along with any fluid traces.

Lasting construction.

You want quality. A record cleaner can last a lifetime. A plastic wonder can crack into oblivion—or you can purchase the hand-rubbed elegance of milled walnut befitting the rest of your audio system.

Ultimate economy.

The value of a truly fine record cleaner is justified by the cost of replacing your record collection. Fifteen dollars is a small investment in long-term protection.

All of the above.

**DISCWASHER, the Superior
Record Cleaner.**

See the finer audio dealers for a demonstration.



discwasher, inc. 1407 N. Providence Rd., Columbia, MO 65201

IT TOOK TOSHIBA TO BUILD THE WORLD'S FIRST DIGITAL-SYNTHESIZED RECEIVER.



The Toshiba 7150 locks into the center of any station's assigned broadcast frequency and eliminates drift.

A few years ago, Toshiba introduced and marketed the first fully electronic digital-synthesized tuner.

Now Toshiba has another first.

We've built a digital-synthesized tuner into a high-powered, low-distortion FM/AM receiver: the Toshiba 7150 with SYNTHETUNE.[™]

SYNTHETUNE is a function that provides tuning so accurate even a center tuning meter is unnecessary. Drift is eliminated.

The 7150's FM tuner section also contains flat group delay IF circuitry. And a quartz crystal oscillator, which automatically locks into the center

of any station's assigned broadcast frequency—as precisely as the station's own transmitter.

Tune the 7150 just by pushing the auto-scan button. It scans the full range of the AM or FM band, stopping precisely at each listenable station.

Bright green LED numerals instantly display all frequencies as they are tuned.

Of course, there's more to the 7150 than SYNTHETUNE.

It also has separate transformers for class A and class B amplifier sections. The toroidal transformer for class B amplification has separate left and right power supplies.

It also has Dolby[®] FM and an air check switch for

accurate tape recording.

Furthermore, the 7150 delivers a minimum of 150 watts per channel into 8 ohms, 20 to 20,000 Hz, with no more than 0.05% THD. And the rest of the specs are just as impressive.

Hear the Toshiba 7150 at better audio dealers. At \$1100.00^{**} it's the top of our line. But every receiver Toshiba makes is engineered just as meticulously.

So they all have one thing in common. Superb sound quality.

TOSHIBA

Again, the first.

Toshiba America Inc., 280 Park Ave., New York, NY 10017

hi-fi/stereo

BUYERS' GUIDE®

CONTENTS: MARCH/APRIL 79

Vol. 14 No. 2

20/ JAZZ

by J. R. Taylor

Taylor focuses his attention on the career of a "living legend": Thelonious Monk.

28/ SOUND PROBE

A critical look at the Wharfedale E-50 and the Celestion D11ton 33 speakers.



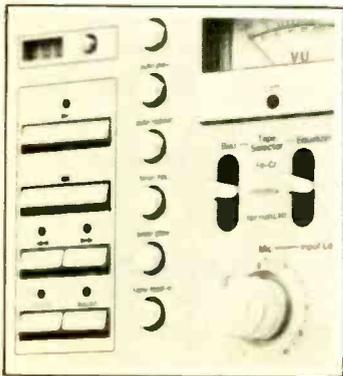
30/ POP DISCS

Irsay spins recent releases from Barry Manilow, Eric Clapton, Gino Vanelli (among others) and tells us what he thinks.

33/ CASSETTE DECK FEATURES

by Fred Petras

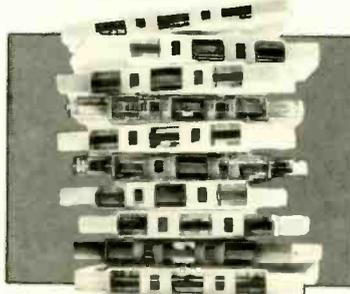
Buying a cassette deck today involves choosing an array of operating features which will meet both your current and future needs. Here's help for buying wisely.



39/ BLANK TAPE

by Fred Petras

The first cardinal rule is: don't buy cheap. Other tips for getting the right tape for your machine are included.



43/ MOVING UP TO BETTER SOUND

by William S. Gordon

Here's how to upgrade your system without starting from scratch. A step-by-step guide.

48/ SPOTLIGHT ON: AIWA AD-6900U CASSETTE DECK

A detailed report on a machine that has compromised nothing to gain the ultimate in cassette sound quality.

51/ DIGITAL SOUND

by Herb Friedman

A look into high fidelity possibilities of the future.

53/ OPERA

by Speight Jenkins

Christa Ludwig's career is reviewed by Jenkins.

54/ SPOTLIGHT ON: LAFAYETTE 120 Db RECEIVER

An expanded evaluation of a stereo receiver of sterling performance and moderate cost.

55/ TEST REPORTS

RECEIVERS
TUNERS
INTEGRATED AMPS
PREAMPS
POWER AMPS
CASSETTE DECKS
RECORD PLAYERS
EQUALIZERS

73/ RECENT STEREO RECORDINGS

Kelly evaluates Bach, Holst, Mahler discs, among others.

DEPARTMENTS

6/ AUDIO SHOWCASE
49/ READER SERVICE CARD
79/ LITERATURE LIBRARY
81/ CLASSIFIED ADS

Cover photo by Dave Niedo.

For details on the Hitachi cassette deck which appears on the cover, see page 75.

© Copyright 1979 by Davis Publications Inc.



Ohm's Law 8:

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

Ohm defies the laws of modern loudspeaker production.

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



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

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

Complete Buyer's Guide to Stereo/Hifi:

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



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

Stereo Review:

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



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

Canadian Stereo Guide:

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



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

Complete Buyer's Guide to Stereo/Hifi:

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

Stereo Review:

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

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

Complete Buyer's Guide:

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



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



We make loudspeakers correctly.

dbx 128 tape copies sound better than your records



First, you play your favorite records, tapes or FM broadcasts through the expander section of our Model 128 to restore missing dynamics and reduce noise that's been robbing you of live performance realism.

Then, you preserve the dynamics of this vibrantly enhanced program by copying through the 128 noise reduction section to eliminate tape hiss normally added by copying.

Finally, you play back your taped copy through the decoder of your dbx 128 and hear music with more dynamic range and detail than you've ever heard before off any tape. Sound unbelievable? Well, it was until the dbx 128 came along. But now you can make dynamically enhanced copies that sound better than the originals, with no hiss build-up, on any open-reel, cartridge or cassette recorder.

To learn how, ask the dbxpert at your local dealer for a demonstration of the new dbx 128. For full product information and a list of demonstrating dbx 128 dealers, circle reader service number or contact:

dbx, Incorporated, 71 Chapel Street
Newton, Massachusetts 02195 • (617) 964-3210

dbx

Circle No. 12 On Reader Service Card

hi-fi/stereo BUYERS' GUIDE®

Electronics Group Coordinator &
Editor-in-Chief
Julian S. Martin

Editor
Christine Begole

Associate Editor
Gordon Sell

Editorial Assistant
Cynthia McClean

Art Director
Ralph Rubino

Cover Design Director
Irving Bernstein

Associate Art Director
David Pindar

Assistant Art Director
Michael Vessio

Art Assistant
Leslie Wallant

Production Director
Carl Barteo

Production Manager
Carole Dixon

Production Assistant
Annette Simon

Advertising Director
Edmund M. Lassus

Subscription Circulation Director
Robert V. Enlow

Subscription Circulation Manager
Eugene S. Slawson

Newsstand Circulation Director
Donald L. Gabree

Marketing Director
James C. Weakley

President and Publisher
Joel Davis

Vice President and General Manager
Leonard F. Pinto

Vice President and Treasurer
Victor C. Stabile

HI-FI/STEREO BUYERS' GUIDE is published bi-monthly by Davis Publications, Inc. Editorial and Business offices: 380 Lexington Ave., New York, NY 10017. All subscription orders and mail regarding subscriptions should be sent to P.O. Box 1855 GPO, NY, NY 10001. One-year subscription (six issues) in the U.S. — \$5.95. Outside U.S.A. and possessions, add \$1 per year. Advertising offices: 380 Lexington Ave., NY, NY 10017. 212-557-9100. Chicago: Didier & Broderick, 550 Frontage Rd., P.O. Box 337, Suite 288, Northfield, IL 60093, 312-446-9571. Los Angeles: Jacques Montague Company, 5900 Wilshire Blvd., Suite 1145, Los Angeles, CA 90036, 213-933-9217. For change of address, please advise 4 to 6 weeks before moving. Send your current mailing label with new address to HI-FI Stereo Buyers' Guide, P.O. Box 1855 GPO, New York, NY 10001. Second-class postage paid at New York, NY and at additional mailing office. © Copyright 1979 by Davis Publications, Inc. ISSN 0018-1218

HI-FI/STEREO BUYERS' GUIDE

Our theory sounds fantastic.



©1977 Koss Corp.

In an industry where trial and error methods are common, the Koss Theory of loudspeaker design may seem out of place. But once you hear the unmatched Sound of Koss in the new CM 1020 loudspeaker, you'll know our computerized theory helped make the optimum 3 bandpass speaker a reality.

The Koss Theory eliminates the guesswork in speaker design by selecting parameters for the best possible performance. That's why every part of the CM 1020 works superbly both alone and as part of the whole.

The dual ports, for example, enhance the woofer's front sound waves and dampen excessive woofer movement. There are two ports instead of one because two allow for improved cabinet tuning and greater structural stability. This added stability keeps the cabinet walls from beginning to flex causing unwanted sound-waves.

The port-augmented 10-inch woofer is a special de-

sign that provides a 3 dB gain in electrical efficiency and a 3 dB down point of 31 Hz while offering maximally flat response over the low bandpass. To capture all the presence and musical energy from 300 Hz to 3.5 kHz, the CM 1020 features a performance synthesized 4½-inch midrange driver. Handling the high bandpass is a 1-inch dome tweeter linked to a unique acoustic transformer. This Koss tweeter produces the highest energy output and lowest distortion of any 1-inch direct radiator tweeter on the market. Finally, to unite all these outstanding elements, Koss developed a unique, seamless crossover network.

Though we've tried to describe the superiority of the Koss CM 1020, nothing can match the thrill of a live performance. Ask your Audio Dealer for a demonstration, or write to Fred Forbes c/o the Koss Corporation for a free brochure of Koss CM loudspeakers. After experiencing the CM 1020, you'll agree: hearing is believing.

KOSS® CM 1020 SPEAKER SYSTEM hearing is believing™

KOSS CORPORATION, 4129 N. Port Washington Ave., Milwaukee, Wisconsin 53212
Koss International/London, Dublin, Paris, Frankfurt • Amsterdam • Koss Limited/Ontario • Koss K.K./Tokyo

Circle No. 18 On Reader Service Card

The better your ear,
the more you
need new
Audio-Technica
**VITAL
LINKS!**

Every wire, every connection in your stereo system is a source of trouble, a chance for losses which can keep your system from achieving its full potential.

Introducing three new Vital Link wire sets from Audio-Technica... each a positive step toward ideal performance and trouble-free operation.



Start at the cartridge with the AT609 Head Shell Wire Set. Color-coded, insulated wires with 14 strands of pure silver Litz wire, terminated in corrosion-free gold terminals. No losses, no intermittents. Easy to install. Just \$6.95 and worth every penny.



Between turntable and amplifier (or any two stereo components) use new AT610a High Conductivity Cable. A stereo pair 60" long, plus an independent ground wire with lugs. Each gold-plated plug is color-coded. Both resistance and capacitance are far

below ordinary cables. Only \$7.95.

For the most critical installations use our AT620 Super-conductivity Cable Set. Two individual cables, each 48" long, with heavily gold-plated plugs. Inside the wire shield is a second conductive layer of polypropylene shielding. Special foam dielectric keeps capacity low, while superb conductivity is assured by using Litz-wire inner conductors with maximum surface area which reduces high frequency losses. The set lists for \$29.95.



From phonograph cartridge to loud-speaker, each audio system is a chain, no stronger than its weakest link. Connect your system with Vital Link cables from Audio-Technica. At your A-T dealer now. Or write for our complete audio accessory catalog.



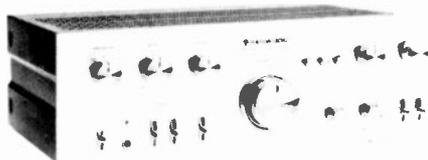
audio-technica
INNOVATION □ PRECISION □ INTEGRITY
AUDIO-TECHNICA U.S., INC.
Dept. 39BG-1, 33 Shawnee Avenue
Fairlawn, Ohio 44313
In Canada: Superior Electronics, Inc.

Circle No. 9 On Reader Service Card

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

Integrated Stereo Amplifier

Kenwood's KA-8100 DC stereo power amplifier, with dual power supplies, is claimed to end phase distortion and crosstalk distortion. The unit has an independent preamplifier power supply, a gain sensitivity control that accommodates moving coil cartridges having 0.8 mV sensitivity, two tape deck capability with A/B dubbing and tape-through circuitry, and selectable turnover points for bass/treble tone controls. Also high and low filters (12 dB per octave), tone defeat and subsonic filters, a six-step loudness control, and a stepped volume attenuator control. Specifications for

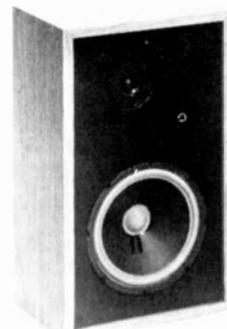


Circle No. 75 On Reader Service Card

the power amplifier section: power output, 75 watts per channel minimum, RMS, at 8 ohms from 20 to 20,000 Hz with no more than 0.03% total harmonic distortion; 1M distortion, 0.03% at rated power into 8 ohms; power bandwidth, 5 to 50,000 Hz; signal-to-noise ratio, 115 dB (short circuited); damping factor, 50 at 8 ohms; input sensitivity/impedance, 1.0 V/50 k ohms; speaker impedance, accepts 4 to 16 ohms. Pre-amp specs: frequency response, phono, +0.2 dB, -0.2 dB (RIAA standard curve); frequency response, aux and tape, +0 dB, -1 dB, 7 to 50,000 Hz; signal-to-noise ratio for phono 1 and 2, from 85 dB for 2.5 mV input to 97 dB for 10 mV input; signal-to-noise ratio for tuner, aux, and tapes A and B, all 110 dB for 150 mV inputs; input sensitivity/impedance for phono, 2.5 mV/50 k ohms (for tuner, aux and tapes, 150 mV/50 k ohms. Price: \$425.

Warm and Harmonious Sound

KLH says that this model CL-2 loud-speaker, which has a frequency range of 52 to 22,000 Hz, gives "sound that is warm and harmonious." The 10-inch



Circle No. 115 On Reader Service Card

woofer of this acoustic suspension type unit complements the low-mass 1-inch soft dome tweeter. A continuously variable tweeter level control can be used to accent the lively top end of the CL-2. The indicated frequency response is claimed to be "impressively" flat within 2 dB. Other specifications: crossover, 1200 Hz; nominal impedance, 8 ohms; minimum impedance, 6 ohms; maximum power handling capacity, 60 watts; minimum power requirement, 15 watts; sensitivity, 91.5 dB at 1 meter with an input of 1 watt shaped pink noise, pi steradian field. The speaker comes in both oak or walnut grain vinyl with removable front grille panel. Dimensions: 23 1/4 inches high by 14 inches wide by 10 3/4 inches deep. Suggested retail price: \$139.

Front-Loading Cassette Deck

Dual's Model 819 front-loading cassette deck includes such conveniences as a fade/edit control for fading out, during playback, any errors made during recording; also a full logic tape transport system and high-speed direct-gear rewind. Precise speed control is assured by use of a high-torque DC servo-control motor. The speed is constantly



monitored and instantly corrected, if necessary, by feedback from an integral frequency generator. The tape stops and the deck is shut off if a faulty cassette jams. Other features include: peak reading meters, peak limiter, separate level controls for mike and line inputs, 20-volt power supply built into each mike input to power high-quality condenser mikes. Specifications: frequency response, 20 to 16,000 Hz with ferric oxide tape and to 17,000 Hz with ferrichrome tape; wow and flutter, less than 0.05% WRMS; signal-to-noise ratio with Dolby, greater than 64 dB with ferric oxide and chromium dioxide tapes, bet-

We just can't quit when we're ahead.



Consider the Sony Audio PS-X70 turntable.

Think of it as a professional transcription turntable, for home use. At a price your audio-conscious home can afford.

Think about two discrete servo-controlled motors. One for the platter. Another for the tonearm.

And while you're thinking about motors, think about Sony's hesitation-free BSL motor. No brushes. No slots. And absolutely no cogging. Just even, uniform rotation. Hour after hour. Year after year.

Our own Quartz-locked Magnedisc servo control system makes Sony direct-drive turntables immune to voltage fluctuations. It takes servo control to a new level of accuracy, by measuring turntable speed at the outer rim of the platter — not at the motor.

There's more you should know: front-mounted feather-touch controls, electromagnetic braking, special four-clamp headshell connector, even resonance-free SBMC cabinet with fluid-filled feet to eliminate acoustic feedback.

But perhaps the most amazing thing about our PS-X70 is that it's not alone.

It's just the top of our line. A whole line of new Sony Audio turntables, most of which have most of the features we've listed here.

And every one is designed as a system. With electronic, magnetic, and mechanical technologies contributing to a balanced level of audio performance no single innovation could achieve.

We know about turntable innovation. We practically wrote the book: direct drive, servo control,

Quartz-locked carbon fiber tonearm, Sony gave you them all. Long before almost anyone knew they existed.

But we also know that innovation alone can't make a great audio component. Sound makes a great audio component.

Like the sound you get from our PS-X70 turntable.

Quit, just because we're ahead?

Not Sony Audio. Not on your life.

SONY[®] AUDIO

Sony Industries, 9 West 57th Street, N.Y., N.Y. 10019.
Sony is a registered trademark of Sony Corporation.

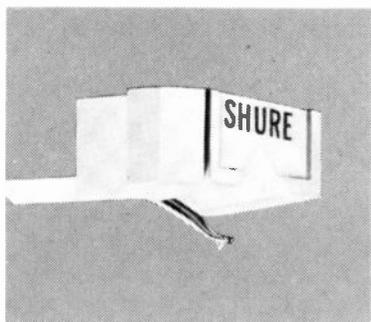
Circle No. 5 On Reader Service Card



Needle in the hi-fi haystack

Even we were astounded at how difficult it is to find an adequate other-brand replacement stylus for a Shure cartridge. We recently purchased 241 random styli that were not manufactured by Shure, but were being sold as replacements for our cartridges. Only ONE of these 241 styli could pass the same basic production line performance tests that ALL genuine Shure styli must pass. But don't simply accept what we say here. Send for the documented test results we've compiled for you in data booklet # AL548. Insist on a genuine Shure stylus so that your cartridge will retain its original performance capability—and at the same time protect your records.

Shure Brothers Inc.
222 Hartrey Ave., Evanston, IL 60204
In Canada: A.C. Simmonds & Sons Limited



Manufacturers of high fidelity components, microphones, sound systems and related circuitry

Circle No. 41 On Reader Service Card

AUDIO SHOWCASE

ter than 67 dB with ferrichrome tape; harmonic distortion, less than 0.7%; crosstalk between stereo channels, greater than 40 dB; speed accuracy, 0.6%. Price: \$429.95.

Battery Operated Record Cleaner

Panasonic's BH-651E battery operated record cleaner employs a "double clean" method that uses a rotary brush to collect dust from the record surfaces and deposit the particles in a built-in dust box. Thin bristles, made from the



Circle No. 83 On Reader Service Card

same type of plastic used to make records (PVC), are only 0.05mm thick and do their work without bruising the record surfaces or causing buildup of static electricity. The brushes, which spin at a high speed of 3000 rpm, are driven by a motor powered by two "AA" batteries (not included). Price: about \$16.95.

Line-leader Linear Tuner

SAE's line-leading Model 8000 FM stereo digital tuner has a linear phase IF section which is credited for a low stereo distortion specification of 0.2% or less and a low noise of 68 dB or less. Precise station tuning is aided by two meters, one used to indicate signal

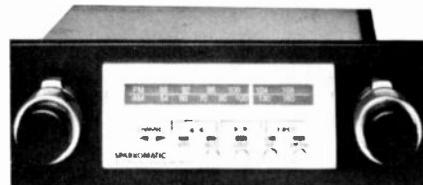


Circle No. 88 On Reader Service Card

strength, the other to define channel centers. Model 8000 has a triple MOS-FET front end and a five-gang variable capacitor that provides a spurious response rejection of over 100 dB and an IHF sensitivity of 1.6 μ V. The tuner's crystal controlled digital readout and FET muting assure precise thump-free tuning, says SAE. Suggested retail price: \$700.

New Car Stereo Line

Sparkomatic Corporation is offering a line of car stereo equipment that the company believes is the "finest and most complete line of car stereo equipment available today." There are twenty



Circle No. 121 On Reader Service Card

models in all, ranging from 30-dollar under-dash 8-track and cassette models to sophisticated high-power 8-track and cassette AM/FM stereo radio combination units. Several have digital readouts. Many models are said to feature electronic controls for loudness, muting, high filter and AM/FM, with LED indicators, auto reserve cassette and automatic key off eject. Typical is the SR-3300 high-power AM/FM cassette deck shown here. Suggested retail price \$259.95.

Cassette Deck for Metal Tapes

JVC's model KD-A8 cassette deck is claimed to one of the first such tape units on the American market that is capable of using new metal tape formulations. Features a microcomputer that matches deck characteristics with tape characteristics, automatically. The new



Circle No. 74 On Reader Service Card

feature is dubbed the "Computer B.E.S.T. Tuning System," with letters B, E, S and T representing bias, equalization, sensitivity and total, respectively. According to JVC, the tuning detects variances even among the same kinds of tapes and compensates for the differences. If a tape is of excessively poor quality, or when the tape select switch is incorrectly set, an error indicator lamp lights. Specifications: frequency response, 15 to 17,000 Hz with normal tape and 15 to 18,000 with SA/CrO₂ and metal tapes; signal-to-noise ratio, 58 dB (ANRS noise limiter off); wow and flutter, 0.035% WRMS; channel separation, 35 dB; crosstalk, 65 dB; total harmonic distortion, 1.2%; fast forward and rewind times, 80 seconds. Price: \$750.

Improved Speaker Line

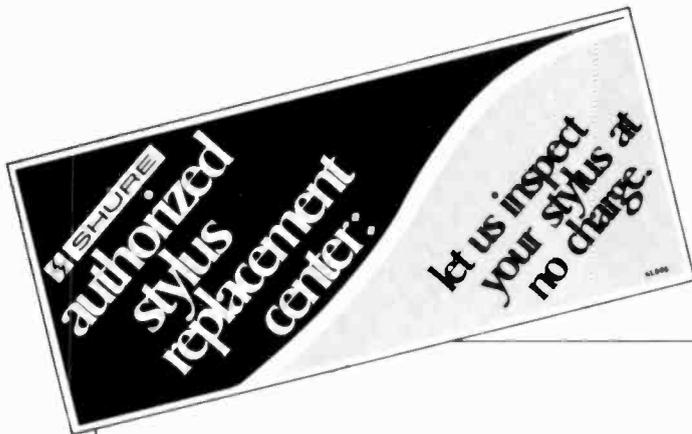
Lafayette Radio Electronics says the Criterion Series 2001 and 2002 speak-

fact: February and March are be-kind-to-your-records/ check-your-stylus months...

FREE! Stylus inspection and cleaning wherever you see this sign:

A cartridge is forever—your stylus isn't! Even though you can't see stylus wear, it affects the performance of your entire hi-fi system. A worn stylus could even ruin your records! We urge you to have your stylus professionally inspected *no less than once a year.*

During February and March, audio dealers displaying this sign will have trained personnel and the equipment necessary to examine your stylus for wear or damage. They'll professionally clean your stylus and tell you if it's time to replace it.

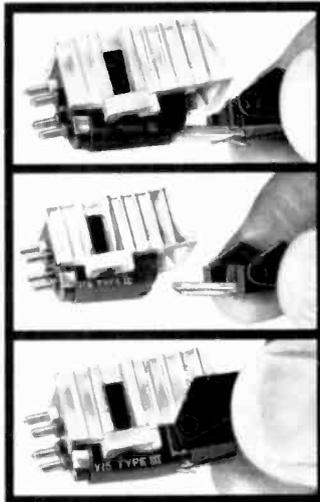


Stylus replacement is very simple and requires no tools or special skills. To remove, grasp the stylus grip between the thumb and forefinger. Gently withdraw the stylus by pulling it forward out of the cartridge.

To replace, grasp the stylus grip between thumb and forefinger and insert into stylus socket. Press the stylus into the socket until the molded housing of the stylus touches the cartridge case.

To prevent damage to the stylus tip or shank, be careful not to allow the finger to slip off the stylus grip.

NOTE: Stylus guard when present should be in "down" position when replacing stylus.

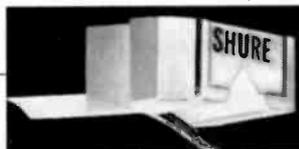


FREE! stylus cleaning brush

A practical and safe way to clean your stylus! Synthetic bristles with the right amount of stiffness to remove dust and lint buildup efficiently without damaging the stylus tip. Free when you have your stylus inspected at a participating Shure dealer.

Bring your cartridge back to original specs

The performance of your cartridge depends largely on the stylus assembly and only a genuine Shure replacement stylus can restore your cartridge to its original performance! Give your record collection the protection it deserves, insist on the words "This Stereo Dynetic® stylus is precision manufactured by Shure Brothers Inc." on the box, and the name SHURE on the replacement stylus you buy. Don't settle for substitutes—your record collection is too valuable!



Replacement styli by ...



Special Note:

Genuine Shure replacement styli are available for virtually *all* Shure stereo magnetic cartridges—whatever their age. If your dealer doesn't have yours, write to us.

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

McIntosh

"A Technological Masterpiece..."



McIntosh C 32

"More Than a Preamplifier"

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

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

Keep up to date.
Send now - - -

McIntosh Laboratory Inc.
Box 96 East Side Station
Binghamton, NY 13904

Name _____

Address _____

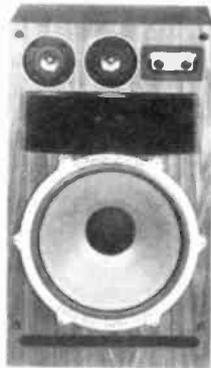
City _____ State _____ Zip _____

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

Circle No. 19 On Reader Service Card
10

AUDIO SHOWCASE

ers have been improved, and a new top-of-the-line model has been added to the series. The 2001 and 2002 series speakers are claimed to have more linear bass response and greater power handling characteristics than their predecessors. Circuit breakers have re-

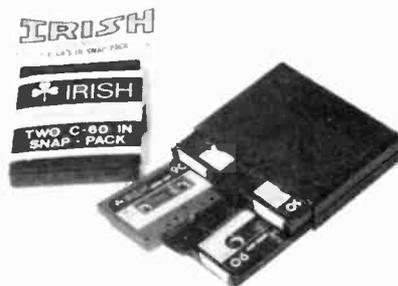


Circle No. 107 On Reader Service Card

placed fuses. A full, woodgrained vinyl veneer plus snap-on acoustically-transparent grille highlight cosmetic improvements. The new 2003A speaker has been engineered to produce the popular "disco" sound. It incorporates a massive 15-inch woofer for strong bass response, plus a 16- by 4 1/4-inch multicell midrange horn and two angularly mounted, matched tweeters that disperse highs over 140 degrees. This speaker can be driven by amplifiers having from 20 to 120 watts output per channel. The Criterion 2001A has a 70-watt capacity, while the 2002A is designed to handle amplifiers delivering between 15 and 90 watts per channel. Price: 2001A, \$129.99; 2002A, \$169.99; 2003A, \$199.99.

"Snap Pack" Tape Modules

New style "Snap Pack" tape cassette modules from Irish brand tapes feature a slide-in drawer in a plastic sleeve to accommodate two cassette tapes. The sleeve itself may be "snap-in stacked"



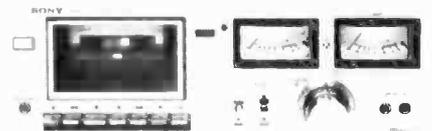
Circle No. 111 On Reader Service Card

atop another sleeve because of the special nesting design. The new pack-

aging is said to eliminate the need of storage racks or other such accessories. Two title tabs, and a pair of self-adhesive strips for under-dash mounting of the pack, come with each unit. Approximate retail prices of the packs containing 60-minute and 90-minute play tapes are \$3.25 and \$4.15 respectively. The Series 2000 Irish tapes feature: screw assembly design, hard windows, quality idler rollers, graphite lubricated liner foils, and individualized spring pressure pads and shields.

Economy Cassette Deck

Sony's model TC-K1A front-loading stereo cassette deck is claimed to combine advanced performance features with convenient operation for budget-minded music lovers. The unit is powered by an "advanced" servo-controlled motor, and features a Dolby noise reduction system. The signal-to-noise ratio is put at 55 dB with Dolby off and using ferrichrome tape. Also claimed is a wide frequency response of 50 to 13,000 Hz \pm 3 dB, and wow and flutter of 0.08% WRMS. The key to the deck's dependable performance is the advanced servo-controlled motor,



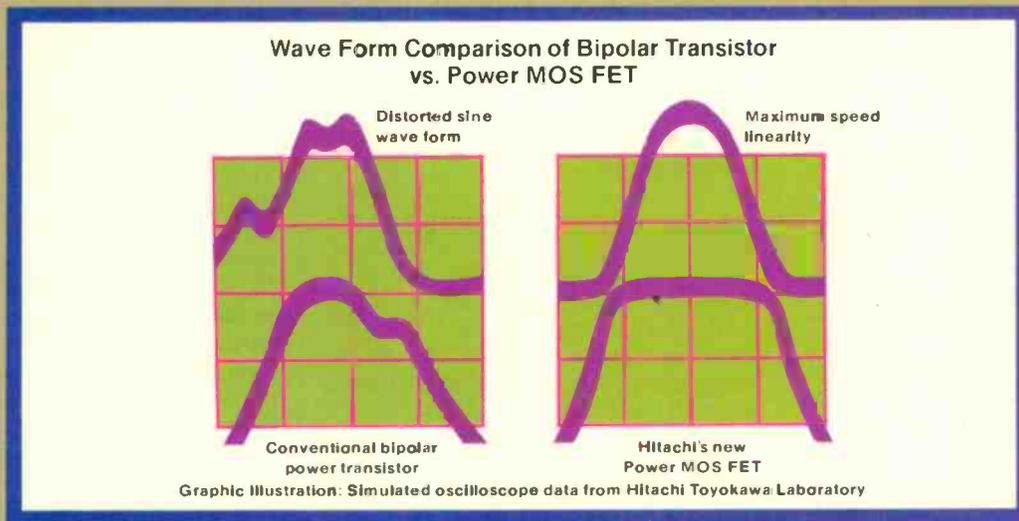
Circle No. 94 On Reader Service Card

according to Sony. The single motor provides highly accurate tape speed and smooth, stable transport. Convenience features include accurate VU meters, and a three-position tape selector designed to optimize bias and equalization for ferrite, ferrichrome, and chromium dioxide tape formulations. The deck's one-button recording system eliminates recording problems while speeding the taping operation. There's also an all mode automatic shut-off, and an automatic tape repeat mechanism. The cassette compartment is air-damped for smooth ejection, and a removable lid permits easy access for cleaning and maintenance of tape heads. All controls are on the front panel. The suggested list price is \$180.

Tonearm Lifter Accessory

There's no longer any need to rush to your turntable to lift the tonearm when music ends, even if your single-play turntable lacks an automatic stop. Thorens has devised a simple automatic tonearm lifter that can be installed on most manual turntables in minutes, according to the company. You don't even need a screwdriver because the unit mounts by means of double-stick

The world's fastest power amplifier



Hitachi Power MOS FET

Hitachi's HMA-6500 Stereo Power Amplifier with the incredible Power MOS FET offers ultra-high switching speed to dramatically reduce output and frequency distortion. At 50 watts output from 20 Hz to 20 kHz, there's no more than 0.02% total harmonic distortion. And the HMA-6500 has such wide linearity

that it refuses to distort even when confronted with the most intense dynamic peaks. Frequency response is ruler flat from DC to 100 kHz, with no crossover distortion.

Add the performance-matched HCA-6500 Stereo Control Amplifier and the FT-8000 Digital Synthesizer Tuner. Both are sleek and stylish performers. The HCA-6500 gives you total control without adding any audible noise or distortion. The FT-8000 is nothing short of an electronic miracle, with digital frequency readout, all-electronic front end, clock function and six station memory.

The HMA-6500, HCA-6500 and FT-8000 — the fastest and the finest from Hitachi.



 **HITACHI**
A sound investment

Audio Component Division, Hitachi Sales Corp. of America, 401 West Artesia Boulevard, Compton, CA 90220, (213) 537-8383, Extension 228

Circle No. 35 On Reader Service Card

QUALITY IN REVERSE

AKAI introduces automatic reverse record at popular prices.

Now instead of interrupting great moments in music when it's time to flip the cassette, AKAI's two newest decks automatically reverse the tape and continue to record or play back.

In addition, the deluxe GXC-735D is loaded with all the features that make the difference between a good deck and a great one. Things like AKAI's exclusive GX (glass and crystal ferrite) heads, guaranteed for 150,000 hours — the equivalent of playing 24 hours a day for 17½ years. As well as feather-touch controls, Dolby,* memory rewind, quick reverse and dramati-

cally recessed red/green illuminated VU meters. Not to mention the kind of specs serious component buyers all over the world depend on AKAI to deliver. (For the more economy-minded there's the CS-732D. Same great auto reverse record/playback feature, with Dolby, quick reverse and tape selector — a lot of AKAI quality for not a lot of money.)

Hear them both at your AKAI dealer or write AKAI America, Ltd., 2139 E. Del Amo Blvd., P.O. Box 6010, Compton, CA 90224. And see how they can reverse your thinking about automatic recording.

GXC-735D: Wow/Flutter — less than 0.08% WRMS; S/N Ratio — better than 58 dB, weighted, at FeCr position, with peak level at 3% THD. Dolby on improves up to 10 dB above 5 kHz. Frequency response — 35-17,000 Hz (± 3 dB) using FeCr tape.

CS-732D: Wow/Flutter — less than 0.08% WRMS; S/N Ratio — better than 57 dB, weighted, at FeCr position, with peak level at 3% THD. Dolby on improves up to 10 dB above 5 kHz. Frequency response — 38-16,000 Hz (± 3 dB) using FeCr tape.

AKAI

You never heard it so good.

Circle No. 4 On Reader Service Card

*TM, Dolby Labs, Inc.



AUDIO SHOWCASE

formation. There's also provision for expansion to accept additional storage boxes.

Mini Loudspeaker Kits for Vans

Ultralinear says that for the very first time you can buy a loudspeaker for your van "that will equal, if not exceed the performance of your home audio speakers." If you can use a screwdriver and can spare 30 minutes of working time, you can assemble the



Circle No. 112 On Reader Service Card

two speakers contained in an Ultralinear Do-It-Yourself Mini-Kit (MK1) at a total cost of \$89.95. All parts are provided, and there is no soldering. There's also a limited offer of two mobile mounting brackets (\$13.95 value) to make the MK1 an even better buy, according to Ultralinear.

Stereo Cassette Tape Deck

Radio Shack's Realistic SCT-30 stereo cassette tape deck features three tape heads, dual-capstan drive, and a complete, double-Dolby noise reduction system for simultaneous Dolby recording and monitoring. The unit also decodes Dolby FM stereo broadcasts when hooked into the tape monitor circuit of a receiver. Other features include illuminated peak-reading level meters, DC servo motor to control tape speed, three-position bias and equalization switches plus a "variable bias adjustment" for balancing to any tape formula. There's also full Auto-Stop, a three-digit counter, up-front mike and headphone jacks, output level control, and power-assisted controls for pause, fast forward, play, rewind, record and stop/eject. Dual concentric knobs permit individual adjustment of the left- and right-channel recording levels, there are tape/source monitor and mic/aux input switches, also LED indicators

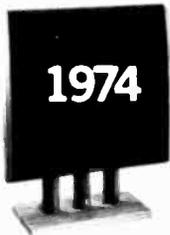


Circle No. 32 On Reader Service Card

for Dolby and record functions. The cassette door detaches completely for easy tape head maintenance. Specs: frequency response, ± 3 dB, 30 to 15,000 Hz with ferric tape and 30 to 16,000 Hz with chrome tape; wow and flutter, less than 0.06% WRMS; signal-to-noise ratio (CrO₂ tape with Dolby "in" and CCIR weighted), 61 dB; distortion at 0 dB, less than 0.9%; crosstalk between tracks, less than -60 dB. Price: \$379.95.

New-Name Loudspeaker System

This GS401A loudspeaker system is the first product to be offered in this country by Gale Electronics Limited, a British firm represented here by Akron-based Audio Potentials. The system contains two, 200-mm bass units, a 100-mm sealed midrange unit and a 19-mm dome tweeter. The bass units are mounted in a damped and sealed enclosure, and are acoustically coupled to reduce harmonic distortion at low frequencies. The tweeter is designed



1974

"The definition is the best I have heard from any dynamic loudspeaker... one of the finest loudspeakers I have ever listened to, giving a precise stereo image without instrument wander."

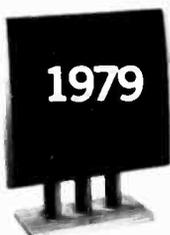
ELECTRONIC ENGINEERING TIMES



1976

"Summing up the DQ-10's, if you get the opportunity to live with them, you will find it very difficult to listen to ordinary loudspeakers afterwards."

PRACTICAL HI-FI & AUDIO



1979

"White noise tests confirm the coloration was exceptionally low—one of the best systems I have yet tested, in fact."

"Owners of DQ-10's are not likely to part with them for many years!"

HI-FI BUYER'S REVIEW

THE BEST LOUDSPEAKER WILL STAND UP TO THE TEST OF TIME.

From its introduction in 1973 to this day, the Dahlquist DQ-10 earned an unending succession of rave reviews from critical audiophile publications and music lovers alike.

The DQ-10, with its patented Phased Array™ driver configuration and diffractionless baffle plate design, established new standards for loudspeaker performance.

The DQ-10 extracts an unprecedented amount of detailed information from recordings. It presents a precisely focused and "boxless" musical image, which preserves the full sense of depth and dimension of the original performance.

Above all, the Dahlquist DQ-10 is an extraordinarily realistic music reproducer. Like the timeless sound of a live performance, the DQ-10 transcends both fads and trends. The listening pleasure it provides does not diminish over time—truly the ultimate test of a loudspeaker.

For Further Information Write To:

DAHLQUIST

27 Hanse Avenue, Freeport, New York 11520



While the others were catching up, TDK was moving ahead.

Shortly after it was introduced in 1975, TDK SA, the world's first non-chrome high bias cassette, was accepted by most quality deck manufacturers as their high bias reference standard. This advanced, new cassette enabled their decks to perform to the limit of their capabilities. And because the decks are set in the factory to sound their best with SA, music-loving consumers made SA the number one selling high bias cassette.

The other tape makers set out in pursuit of SA, hoping someday to equal the performance of its Super Avilyn particle formulation and the reliability of its super precision mechanism.

But making the world's most advanced cassette was nothing new for TDK's engineers. They pioneered the high fidelity cassette back in 1968 and for more than a decade they've led the way in cassette tape technology. Over the last three years, they've refined SA and made

it clearly superior to the '75 version.*

That makes the music lovers happy; it means more music with less distortion. It makes the deck makers happy; they've been improving their decks and SA makes them sound better than ever. But for the competition, unhappily, it means a whole new standard to catch up to.

So if you'd like to raise your own recording standards, step up to TDK SA, the high bias reference tape backed by high fidelity's original full-lifetime warranty.**

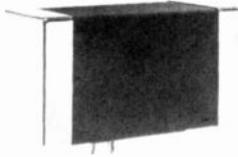
TDK Electronics
Corporation,
Garden City,
New York 11530

 **TDK**
The machine for your machine.™



*Today's SA has a maximum output level (MOL) more than 3dB better than that of 1975 SA at the critical high frequencies, and improved sensitivity across the entire frequency range. **In the unlikely event that any TDK audio cassette ever fails to perform due to a defect in materials or workmanship, return it to your local dealer or to TDK for a free replacement. ©1978, TDK Electronics Corp.

AUDIO SHOWCASE



Circle No. 109 On Reader Service Card

for optimum frequency dispersion as well as unusually extended response, according to the manufacturer. Typical frequency response in an "average" room is better than 35 to 20,000 Hz ± 5 dB while crossover frequencies are at 475 Hz and 5000 Hz. Gale recommends that the speakers be used with amplifiers providing from 60 to 200 watts RMS per channel into 8 ohms. Each loudspeaker has balance controls for midband and treble. The cost of each GS-401A is \$525. The jazzy matching chrome base will set you back another \$75 each. For the benefit of those have not yet started thinking metric, those 200- 100- and 19-mm driver dimensions are nominally 8, 4 and $\frac{1}{2}$ inches.

High Bias Audio Cassette Tapes

Memorex has replaced the company's line of chromium dioxide cassette tapes with a new ferrite crystal oxide formulation line that is claimed to provide "outstanding" sound reproduction when used at high bias (chrome/CrO₂) 70-microsecond equalization machine setting. Claimed attributes of the new product: excellent performance at critical high frequencies for brilliant sound; low noise and increased maximum out-



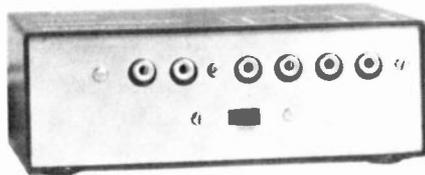
Circle No. 114 On Reader Service Card

put levels for excellent signal-to-noise ratio; ability to record at high levels without saturation to provide wide dynamic range and broad recording flexibility. The new line also features a new type of album having a unique

built-in hub lock system that allows a cassette to be inserted into the album in either direction. The album also has a snap-lock that limits the swing of the album lid when open, and prevents accidental opening when closed. The cassettes themselves are assembled by means of sonic welding, rather than with screws "for best guarantee of precision assembly," according to Memorex. Suggested retail prices of the 60- and 90-minute lengths are \$4.39 and \$5.99 respectively.

Subwoofer Crossover Kit

Ace Audio's model 5000 Electronic Crossover is designed especially for operation with any subwoofer, and with the new super "mini speakers" made by Rogers, Visonik, ADS, Yamaha and others. The 5000 is a self-contained unit which crosses over at 18 dB/octave at a frequency of 100 Hz. Provision is made for using either a mono amplifier for the subwoofer, or connecting a



Circle No. 120 On Reader Service Card

stereo amplifier to plus and minus outputs so that both channels can be driven in mono mode for double the power output. A level control allows precise adjustment of the subwoofer output, and a defeat switch permits accurate subwoofer balancing to the rest of the system without use of instruments. Noise is said to be -90 dB, and distortion is less than 0.025% at 2V output level, and typically 0.01%. The unit employs precision metal film resistors and polystyrene capacitors to ensure accurate response at crossover, according to Ace. All parts mount on a single PC board and construction is said to take about three hours at most. Prices: kit, \$59.25; factory wired and tested, \$99.50.

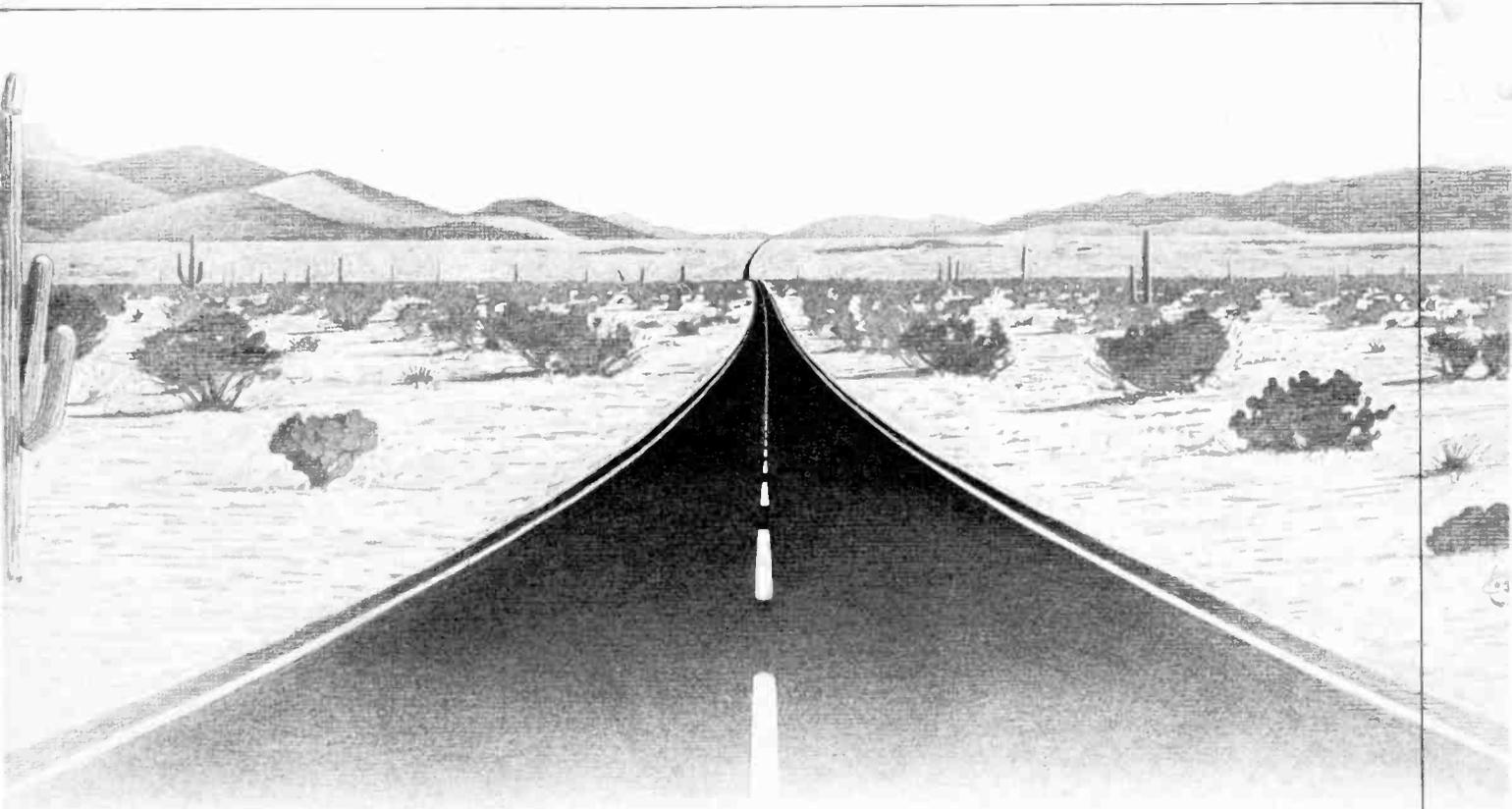
In-dash Player, Receiver, Clock

Craig Corporation offers a new in-dash sound system that includes a stereo cassette tape player, Auto-Scan AM/FM/MPX receiver and a digital clock. Model T635 has a PLL (Phase-Locked Loop) synthesizer scanning system for simplified station selection. There's 10-station manual and preset tuning, and capability for programming to scan selected stations or the entire broadcast band. An extra bright digital readout displays the exact radio frequency or the time of day. Other features include: full power-off eject and end-of-tape eject; separate balance and fader con-

Mitsubishi Car Audio Dealers

- | | |
|---|---|
| ARIZONA
Hi FI SALES COMPANY
Mesquite | KANSAS
AUDIO SYSTEMS
Wichita |
| CALIFORNIA
AUTO RADIO HEADQUARTERS
Oakland | CUSTOM SOUND INC
Wichita |
| CALIFORNIA CAR STEREO
Hayward | HAYES SIGHT & SOUND
Hutchinson |
| DOV SOUND CITY CAR STEREO
San Diego | KENTUCKY
AUDIO WAREHOUSE
Louisville |
| RADIO SUPPLY COMPANY
Sacramento | MASSACHUSETTS
K & L SOUND SERVICE CO
Watertown |
| SOUNDWORKS
Emeryville | MICHIGAN
ALMAS HI FI STEREO
Dearborn |
| THE FEDERATED GROUP
West Los Angeles | ELECTRONIC SOUND
Grand Rapids |
| Hollywood | MINNESOTA
AMALGAMATED AUDIO
Winona |
| Westminster
Canoga Park | DAYTON S
Minneapolis |
| La Puente | MR MUSIC MAN
Moorhead |
| THE GOOD GUYS
South San Francisco | MISSOURI
INDEPENDENCE AUDIO
Independence |
| THE SOUND ROOM
Modesto | NEW JERSEY
ABC WIDE WORLD OF MUSIC
Hackensack |
| SAN JOSE STEREO TAPE
San Jose | ARMANDS SOUND ODYSSEY
Cherry Hill |
| SOUND COMPANY
San Diego | AUDIO DISCOUNT W/HS SALES
West Long Branch |
| COLORADO
ESP COMPANY INC
Englewood | SOUNDWORKS
Greenbrook |
| SOUNDTRONICS
Greeley | NEW YORK
CLASSIC CAR STEREO
Great Neck |
| CONNECTICUT
PJS INC
East Hartford | THE AUDIO THRESHOLD INC
Webster |
| FLORIDA
AUDIO GARAGE INC
Winterpark | NORTH CAROLINA
AUDIO & VIDEO CONCEPTS
Winston Salem |
| CONSUMER WAREHOUSE
Jacksonville | CAR STEREO DISTRIBUTORS
Raleigh |
| ELECTRONIC CENTER
Miami | CB ELECTRONICS
Whiteville |
| HART S APPLIANCE
& STEREO CENTER
Daytona | SOUND HAUS
Durham |
| HI FI FO FUM INC
Pinetree Park | OHIO
GENE SHIPP'S CARLIN AUDIO
Dayton |
| LUSKINS HIGH FIDELITY
Hollywood | THE SOUND CONNECTION
Canton |
| SOUND INVESTMENT
CAR STEREO INC
Tampa | PENNSYLVANIA
TEPPER AUTO SOUND
Philadelphia |
| GEORGIA
BACK DOOR STEREO INC
Atlanta | TENNESSEE
AUDITION
Kingsport |
| GODWIN DISTRIBUTING COMPANY
Marietta | H & W ELECTRONICS INC
Jackson |
| IDAHO
ASCENSION STEREO
Sandpoint | TEXAS
B & M ELECTRONICS INC
Houston |
| LANDMARK DISTRIBUTING
Idaho Falls | UTAH
INKLEY S
Salt Lake City |
| ILLINOIS
AUTO SOUND
Skokie | ZCMI
Salt Lake City |
| CAR HI FI
Downers Grove | WASHINGTON
BRY S APPLIANCE
Marysville |
| CONTROL'S UNLIMITED
Arlington Heights | SPEAKERLAB INC
Seattle |
| CUSTOM CAR STEREO
Oak Lawn | WEST VIRGINIA
HIGH FIDELITY COMPANY
Charleston |
| GLENN POOR S AUDIO VIDEO
Urbana | WISCONSIN
AUTO RADIO STATION
Madison |
| R & S AUTOMOTIVE SOUND INC
Capertersville | PORT OF SOUND
Milwaukee |
| TEAM ELECTRONICS
THE STEREO SYSTEMS CO
Aurora | SOUND GALLERY
Racine |
| UNITED AUDIO CENTERS INC
Chicago | |
| WILLARDS S AUDIO TV CB
Lombard | |
| INDIANA
CLASSIC STEREO
Fort Wayne | |
| HI FI BUYS
Indianapolis | |
| PRO AUDIO
Lafayette | |
| IOWA
AUDIO ODYSSEY
Davenport | |
| RENIER COMPANY
Dubuque | |
| WALDEN PHOTO & STEREO INC
Waterloo | |

MITSUBISHI®
CAR AUDIO
SOUND US OUT



Miles Ahead in Car Audio Components

You're aware of Mitsubishi audio component systems for your home as well as the superior quality, performance and design that goes into them. Now Mitsubishi engineers have followed through with that same "separate components" premise, and we now want you to be fully aware of our new component systems for your car.

Start with the CV-21 Power Amplifier and the CJ-20 FM Tuner. Then choose the CX-21 Auto-Reverse Cassette Deck or the CX-20 Cassette Deck. Add up to six speakers including a pair of SX-30 two-way Alumi-Die Cast Enclosed



speakers for a total car audio system worthy of the name Mitsubishi.

Now a word about "specs"...we have always believed in rating our equipment's performance conservatively. Only you benefit from this caution. "Sound us out" before you buy any other car stereo system. You'll be miles ahead with Mitsubishi.

A complete line of components, in-dash/under-dash units and speakers await you at select audio and car audio dealers. Check the list adjacent to this ad for the Mitsubishi Car Audio dealer nearest you.

 **MITSUBISHI®**
CAR AUDIO
SOUND US OUT

© 1978 Melco Sales, Inc.

Dealer inquiries invited: Contact Melco Sales, Inc., 7045 N. Ridgeway Ave., Lincolnwood, Ill. 60645, 800-323-4216 (Outside Ill.), 312-973-2000 (Within Ill.)

Circle No. 34 On Reader Service Card



**We build
a speaker
that sounds
like music**

It can accurately reproduce the 120+ dB peaks that are found in some live music. That's more than just being able to play music loud. It can accurately reproduce the music bandwidth - from below 25Hz to 20kHz. And the Interface:D's vented midrange speaker reproduces midrange sounds with the clarity and purity that allows precise localization of sound sources - both lateral and front-to-back.

The Interface:D is the only commercially available speaker we know of that can meet these criteria. Audition them at your Interface dealer.



Electro-Voice®

a **gibson** company

600 Cecil Street
Buchanan, Michigan 49107

Interface:D™

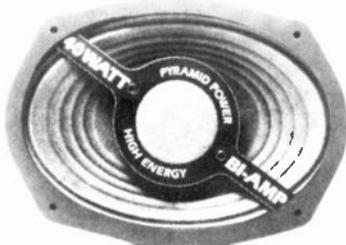
Circle No. 39 On Reader Service Card

AUDIO SHOWCASE

controls; locking fast forward and rewind; stereo indicator light; power antenna switching. The suggested retail price is \$299.95.

Bi-Amplifiable Car Speaker

Pyramid Industries offers a full-range PMS-2A Bi-Amplifiable 6- by 9-inch car speaker that permits the use of separate amplifiers to drive the woofer and tweeter. The company says that bi-amplification, heretofore used primarily in professional audio applica-



Circle No. 117 On Reader Service Card

tions, is used increasingly in car stereo systems for several good reasons: you get more sound from the total output wattage, more effective equalization, lower distortion, and greater reliability. The PMS-2A performs at 104 dB/SPL per watt, per meter. Power handling is rated at 40 watts RMS into 4 ohms, the crossover frequency is 4500 Hz, and frequency response is 70 to 20,000 Hz, according to Pyramid. Price: \$109.97 per pair.

Give-Away Storage Module

Buy four "D" C-90 TDK audio cassettes and you'll get—for free—a storage module holding up to eight cassettes. The retail value of the module is put at \$2.50 by the company. The "D" (for "Dynamic") audio cassettes are said to be modestly priced, yet offering both high output and low noise characteristics, hence they are suitable for portable cassette recorders as well as for auto and home stereo machines that are adjusted for normal bias. The shell of the cassette is of five screw design. Tape

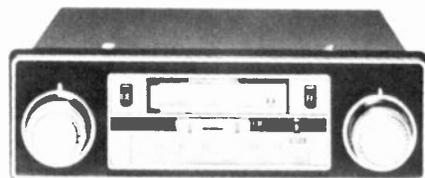


Circle No. 113 On Reader Service Card

lengths available range from 30 minutes playing time to 180 minutes which is said to be the only such long-play cassette now available. Price of four "D" C-90 cassettes: \$11.16.

Car Receiver/Cassette Unit

This new J.I.L. Model 631 radio and tape recorder combination for cars offers an AM/FM/MPX radio having a FET front end for good sensitivity



Circle No. 110 On Reader Service Card

and clear reception. A phase-lock-loop circuit; the multiplex enhances stereo separation in the FM mode. A local/distance switch assures good reception in any area, and a handy slide bar quickly selects either AM or FM mode. The stereo cassette section is designed to keep wow and flutter at a minimal 0.35%, signal-to-noise ratio at greater than 53 dB, and stereo separation at 42 dB. The locking fast forward control with auto stop and a manual eject button complete the tape section controls. Adjustable shafts assure easy installation in virtually every car. Shipping to the company. Price: under \$190.

Kit With Nestorovic Woofer

Speakerlab's "Thirty" speaker system is said to be the first consumer speaker kit to employ a patented Nestorovic woofer system designed by Mila Nestorovic. The three-way system uses

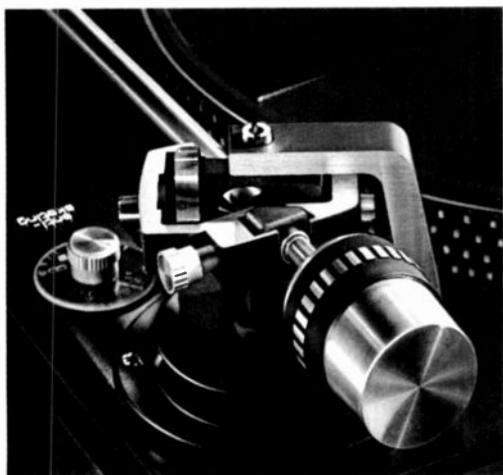


Circle No. 105 On Reader Service Card

specialty-constructed 8- and 10-inch woofers in conjunction with a 4-inch dense-foam-edge midrange cone driver and a one-inch recessed dome tweeter. This is neither a dual-coupled or passive configuration. Although the woofers share a single 1.8 cubic foot enclosure, they are selectively active or passive at different frequencies. A special network enables both woofers to work actively in upper bass frequencies and

HI-FI/STEREO BUYERS' GUIDE

We'll match the tonearm on our lowest-priced turntable against the tonearm on their highest-priced turntable.



We'd like to be very clear about what we have in mind. By "their" we mean everyone else's. And, our lowest-priced turntable is the new CS1237.

The CS1237's tonearm is mounted in a four-point gyrosopic gimbal—widely acknowledged as the finest suspension system available. The tonearm is centered, balanced and pivoted exactly where the vertical and horizontal axes intersect.

From pivot to tonearm head, the shape is a straight line, the shortest distance between those two important points. (Curved tonearms may look sexier, but at the cost of extra mass, less rigidity and lateral imbalance—none of which is consistent with good engineering practice.)

Tracking force is applied by a flat-wound spring coiled around the vertical pivot, and this force is maintained equally on each groove wall whether or not the turntable is level. The tonearm's perfect balance is maintained throughout play.

By contrast, tonearms which apply tracking force by shifting the counterweight forward are actually unbalanced during play and prone to mistracking. For example, on warped records the stylus tends to dig in on the uphill side of the warp and to lose contact on the way down.

Vertical-bearing friction in the CS1237 tonearm is astonishingly low—less than 8 milligrams. It can track as low as 0.25 gram—which means it will allow *any* cartridge to operate at its own optimum tracking force.

There's still more. The counterweight is carefully damped to attenuate tonearm resonances. Anti-skating is separately calibrated for all stylus types. Cueing is damped in both directions to prevent bounce. And because the CS1237 can play up to six records in sequence, the stylus angle can be set for optimum vertical tracking in either single-play or multiple-play.

To find any other tonearm that seriously matches the CS1237's, you have two choices.

You can consider one of the more exotic separates. But you'll find they cost as much as the entire CS1237. (Price: less than \$180, complete with base and cover.)

Or you might compare it with one of the higher-priced Dual turntables. You'll find a few additional refinements, but no difference in design integrity or manufacturing quality. Which is why no other turntable quite matches a Dual. Any Dual.



For the life of your records



United Audio, 120 So. Columbus Ave., Mt. Vernon, NY 10553

Write directly to Manufacturer for Literature.

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



stereo II

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

- Increases Signal up to 16 Times
- Will Not Overload in Strong Signal Areas
- Provides Crisp, Clear FM Reception
- Switch for FM and AM Reception
- No Adverse Effect on AM Reception
- Extends FM Reception Range
- L.E.D. Indicator Light
- Linear Potentiometer Gain Control
- SOLID State - Dual MOSFET Circuitry

**Highest gain FM
auto amplifier
available...**
write for catalog

No. 20-852, Dept. BG4-79

THE FINNEY COMPANY

34 West Interstate Street, Bedford, Ohio 44146
(216) 232-6161

JAZZ



Thelonious Monk/by J. R. TAYLOR

□ In the late 1970s, pianist and composer Thelonious Monk has returned to the "living legend" status he held until twenty years ago. In the 1940s and early 1950s, Monk was thought too unconventional for popular acceptance. In the 1970s he has suffered from illness and kept out of the public eye. Yet some intimates insist that the intensely self-directed pianist simply prefers not to play—thus his infrequent appearances since 1972, and his complete withdrawal from public view since mid-1975.

When he first attracted attention in 1941 as a member of the often experimental house rhythm section at Minton's Playhouse in Harlem, Monk was a twenty-three-year-old Teddy Wilson disciple with a fluent technique. As the 1940s progressed, however, Monk's musical ideas co-influenced those of Dizzy Gillespie and Charlie Parker, and he became known as a weird and inaccessible "mad genius." The increasing terseness of his playing, his disdain to use obvious facility and padded melodic lines, his affinity for dissonance and rough timbres—all contributed to the public image of a barely competent performer who had composed a few "good tunes" such as the pop favorite "Round About Midnight" (actually, Monk's collaboration with trumpeter Cootie Williams). In 1951, a false narcotics charge lost Monk his New York State Liquor Authority per-

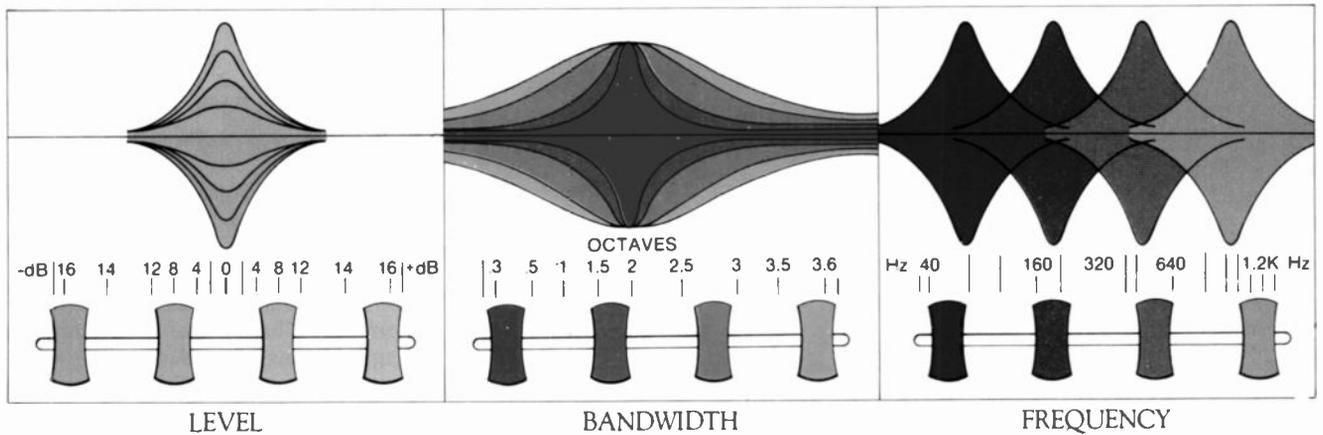
former's card for six years, cutting him off from performances in New York City, where the core of the most critical audience is located. But after 1957, records and personal appearances brought Monk into greater and greater prominence, culminating in a *Time* cover story in 1964.

In truth, Monk's music provided an indispensable example of economy and compositional wholeness to the equally modernist bop movement, which at times seemed in danger of veering into baroque excess. By emphasizing motivic variation in solos that related to chord progressions and to melodic themes, Monk avoided the "change-running" and scale-running emptiness of the mere virtuoso; apprenticeships with the pianist proved valuable to soloists who were as different as the rhapsodic John Coltrane and the logical Sonny Rollins. And the keystone of Monk's appeal—a meticulous rhythmic subdivision that relies upon subtlety of timing and accent rather than speed of execution—has been amplified by his creative relations with many major drummers, particularly Art Blakey.

Fortunately, at this time every single Monk recording is in print.

(Continued on page 80)

J. R. Taylor is the coordinator of the National Endowment for the Arts' Jazz Oral History Project at the Smithsonian Institution. He was formerly curator of the Institute of Jazz Studies at Rutgers University.



With the graphic equalizer, you have a limited number of chances to correct an infinite number of potential problems in a recording or listening environment. You're dealing with fixed bandwidths and fixed frequencies. You can only increase or decrease the level. When boosting or cutting frequencies,

you have to settle for the nearest one or two octaves. It's a compromise. With the parametric, you're provided an infinite number of solutions. Bandwidth, frequency and level are each determined by you. Any musical problem can be isolated and corrected. And that's what all the excitement's about.

The graphic reason to buy our parametric.

At SAE, the battle has always been for complete musical control. Control that would allow you to correct for any inadequacy in any recording or listening environment.

Now the battle is over. You won.

SAE introduces the 180 Parametric Equalizer.

Actually, if you work for a recording studio, "introducing" would hardly be appropriate. You'd be working with parametrics already. Very simply, it's a matter of flexibility and precision. And very simply, with the SAE 180, the flexibility and precision of your sound control are absolutely limitless.

We should let the parametric speak for itself.

Problem: The lead singer is overpowered by the back-up group.

Solution: Set Level control to +10dB. Sweep Frequency control until the voice is brought

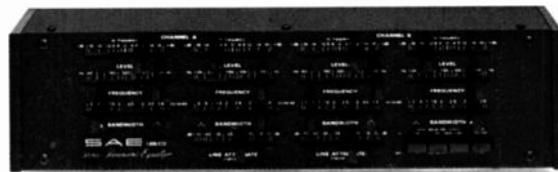
forward. Adjust Bandwidth control to encompass the full voice range. Tailor Level control to exact voice presence desired.

How much does a machine like this cost? How can I afford a component that can acoustically correct a system? How can I buy an electronic box that can fix a listening room and a recording at the same time?

The SAE 180 costs \$250.* That's how.

What we have is a small miracle that is also an attainable reality. Imagine: Complete, precise, musical control for the price of a common graphic.

Remember that word: Parametric. Remember that number: 180. And remember that name: SAE.



I want control. Send information.

Name _____
 Address _____
 City _____ State _____ Zip _____

SEND TO: SAE, P.O. Box 60271, Terminal Annex,
 Los Angeles, California 90060

SAE

Scientific Audio Electronics, Inc.

Circle No. 24 On Reader Service Card

*Nationally advertised value, actual retail prices are established by SAE Dealers.

Nikko. Not Any Stereotype!



Unlike any stereotype, Nikko Audio actually delivers the seed of sound in our professional series.

The Gamma V Synthesized FM Digital Tuner has a LED readout showing locked-in MHz numbers. Accuracy on the button.

The EQ 1 Graphic Equalizer shapes the acoustics of your room into a recording studio.

The Alpha III Power MOS-FET DC Amplifier has the lowest THD anywhere

near the price range—0.008% (80 watts per channel, both channels driven into 8 ohms, 20 Hz to 20 kHz).

Call our toll-free number for your nearest Nikko dealer: (800) 423-2994.

Nikko Audio

16270 Raymer Sr., Van Nuys, Calif. 91406 (213) 988-0105
In Canada: Superior Electronics, Inc. © Nikko Audio 1978

Circle No. 20 On Reader Service Card

Even the best recordings played on the best component stereo systems fail to fully recreate the ambience of music performed live. That's because most listening rooms are small and

acoustically dead.

gives music room to be heard

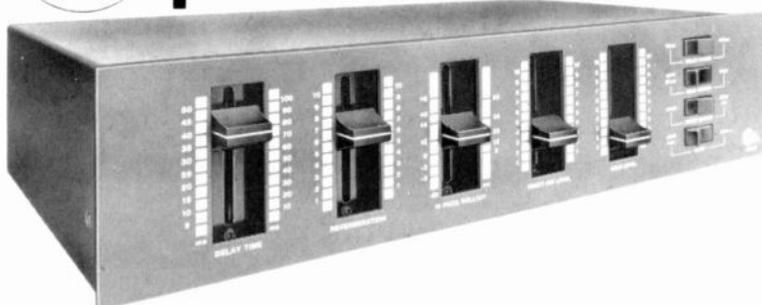
The SD-550 Ambience Restoration System recreates the environmental envelope of music performed live by recovering the natural ambience and distributing

sound throughout the room. This ambience restoration produces a musically valid listening experience irrespective of room limitations.

To hear ambience restoration for yourself, take your favorite record to your Sound Concepts dealer and ask for a demonstration. For complete information and the name of your dealer, please write to us.



27 Newell Road, Brookline, MA 02146 • (617) 566-0110



Circle No. 38 On Reader Service Card

AUDIO SHOWCASE

yet shift some signal input away from the lower 10-inch woofer at lower frequencies. Thus the smaller woofer "sees" an increasingly large enclosure size as demand for lower frequencies increases. The claims: extremely high magnetic flux densities in the woofer voice coil gaps; 30% greater driving force for the 8-inch woofer than obtained with Speakerlab's conventional 8-inch woofer. The S30 is equipped with a three-position, woofer damping switch to help overcome problems with warped records and other sources of subsonic noise. Dimensions: 31 inches high by 12 1/2 inches wide by 10 1/2 inches deep. Prices: walnut kit, \$330 each; walnut grain vinyl kit, \$285 each.

"Improved" Studio Cassette Series

BASF Systems offers an "improved" studio cassette series of tapes that feature higher coercivity, higher bias, and greatly improved performance attri-



Circle No. 106 On Reader Service Card

buted to a recently developed oxide particle that is claimed to deliver one to two dB more output at the high end. Prices: C-60, \$2.99; C-90, \$4.49.

Turntable Spirit Level

This Dual-Plane, Spirit Bubble Level by Robbins Industries, catalog no. 41-133, is used to adjust the proper azimuth and zenith leveling of automatic



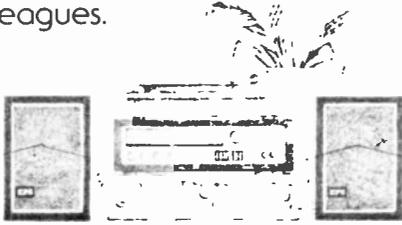
Circle No. 108 On Reader Service Card

and manual turntables to obtain maximum performance. The "T-level" consists of two over-sized precision levels mounted 90 degrees to each other and

THE LS70 CAR SPEAKER SOUNDS LIKE A HOME SPEAKER BECAUSE IT'S MODELED AFTER ONE OF THE BEST.

	LS70	EPI70
Frequency Response	70-20 KHz	60-20 KHz
Crossover	1800 Hz	1800 Hz
Dispersion	Nearly hemispherical in musical range	Nearly hemispherical in musical range
Tweeter	1" air spring	1" air spring
Woofer	6" long traverse	6" long traverse
Impedance	8 Ohms nominal 4 Ohms D.C.	8 Ohms nominal 4 Ohms D.C.
Grille	Acoustically transparent perforated metal	Acoustically transparent matte-black foam

Up until now there have been car speakers and there have been home speakers, but quite frankly, they've been in two different leagues.



We patterned the LS70 after the much acclaimed EPI 70.

We decided to change that. We designed the LS70, a high performance, 2-way system that fits into a standard 6" x 9" cutout, to meet the same high standards we set for our much acclaimed EPI 70 loudspeaker.

The result is a car speaker that performs like no car speaker ever performed. You get remarkably clear, accurate, "Linear Sound." The arm is derived from the way

a frequency response graph looks when it records perfectly accurate sound reproduction; a straight line runs all the way from the deep bass end to the high treble end.

To achieve this, we add no artificial boosting to the bass. Our treble delivers all the subtle overtones that just fade away on most speakers.

Next, you get dispersion that other speaker manufacturers can only dream about — it fills your car with a complete range of natural, uncolored sound.

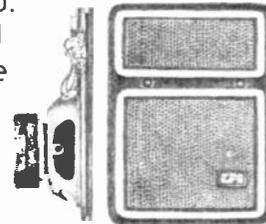
Plus, LS70's can handle over 60 watts per channel.

Most other speakers blow up at considerably less than this.

Granted, the LS70's cost somewhat more than most car speakers, but in return you're getting a system that is every bit as good as exotic separate-component systems.

Stop into your local EPI Car Stereo dealer and see the

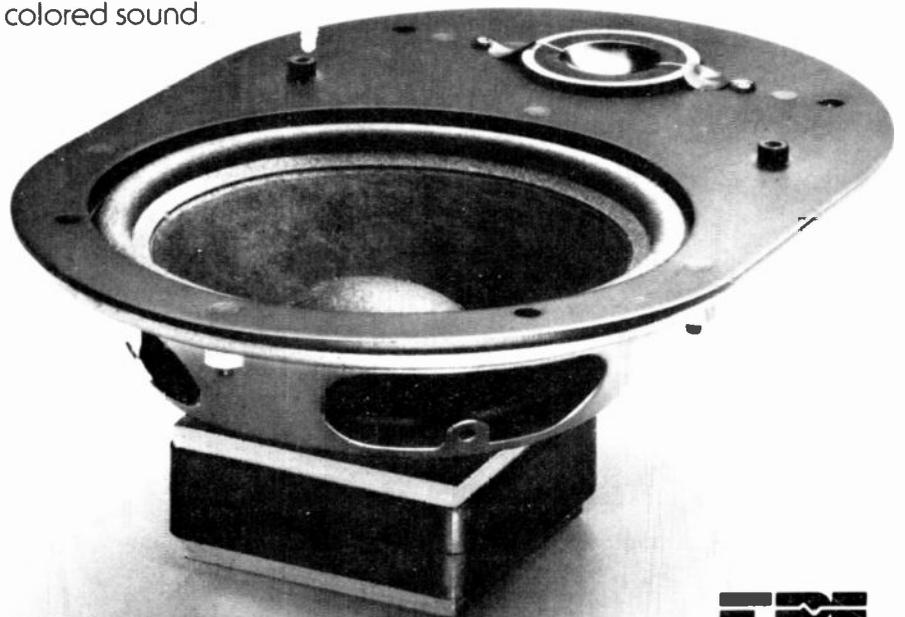
LS70's for yourself. See if it's not a system that you can feel right at home with.



LS70 CAR SPEAKER

THE FIRST CAR SPEAKER SYSTEM THAT YOU CAN FEEL RIGHT AT HOME WITH.

Pat. Pending



Epicure Products Incorporated, Newburyport, MA 01950

Circle No. 14 On Reader Service Card



This is the two-way miniature speaker system you can assemble yourself in about an hour with just a tube of glue and a staple gun.

With a 1" dome tweeter and 6" butyl surround woofer, the Speakerlab .1 puts out sound that makes other little speakers and lots bigger ones quake in their enclosures. In 4-ohm impedance it's just about the ultimate car speaker; in 8-ohms, you've got extension speakers that may sound better than your larger ones.

There are eight other Speakerlab kits you can make with your hands, too. Like our best all direct radiator system, the Three. It uses the same midrange and tweeter combination as the Point One.

And, to extend the bass in depth, clarity and volume, a 12" woofer that we build ourselves. With low-noise butyl rubber cone surround, efficient 40 oz. magnet, and distortion-free excursion capacity, it uncorks the bottom of any bass passage. At the sensible, direct-to-audiophile kit price of \$135 each.

Send for our 52-page color catalog and learn just how easy it is to save money by building your own. We design great speaker kits so you can afford great speakers.



Send me your 52-page color catalog/manual of quality handmade speaker kits and raw speakers.

name _____
address _____
city _____
state _____ zip _____

Speakerlab
Dept. HS-A 735 N. Northlake Way
Seattle, WA 98103

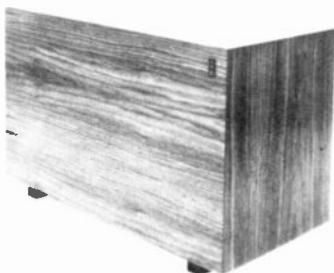
Circle No. 36 On Reader Service Card

AUDIO SHOWCASE

marked with prominent positioning lines. It's constructed of white high-impact plastic to impart high visibility. Suggested list price: \$4.25.

Sub-Woofer

Osawa & Co. offers a Chartwell SW-135 sub-woofer that is claimed to significantly extend and enhance deep bass response of compact bookshelf speaker systems, and in particular of the Chartwell LS3/5A and PM-100 speaker systems. The unit is intended to rectify a basic problem with all small speakers; the inability to move the large volume of air needed to produce high-level bass that is so popular. The SW-135 sub-woofer added to a pair of LS3/5A or PM-100 speakers is said to provide a ± 2 dB response "across the vital octave and one-half from 40 to 120 Hz, thus complementing the extraordinarily flat performance of these speaker systems at the higher frequencies." A single sub-woofer can handle both left and right channels simultaneously.



Circle No. 104 On Reader Service Card

The SW-135 utilizes a 12-inch driver with a polypropylene cone, double spider construction, and a voice coil rated to withstand 200 degrees C. The 80 RMS capacity makes the sub-woofer suitable for music and speech with amplifiers rated up to 150 watts per channel. Acoustic output is 85 dB SPL at one meter at one watt (82 dB with mono input), and the frequency response of the stereo signal passed on to the smaller speakers is within ± 0.5 dB from 250 to 20,000 Hz, according to the manufacturer. Price: \$400 in genuine teak or walnut veneer.

"Super" Car Stereo Systems

Audiovox is introducing a totally new line of "ultra, super auto-sound systems" in a Special Performance Series (SPS). The systems are designed to "fit perfectly" in most American and Foreign-make cars, and will be made available through new car dealers. The

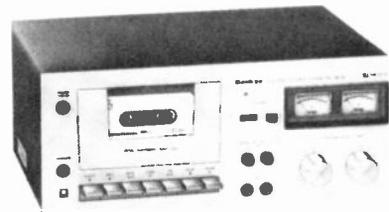


Circle No. 116 On Reader Service Card

SPS-DG-8, says Audiovox, offers a "revolutionary" electronics tuning AM/FM/MPX pushbutton radio together with 8-track tape, digital readout, quartz clock. Also featured are a "Seek and Scan" system that searches stations electronically, four-way speaker balance, and a power output of 20 watts per channel. Price: \$475.

Front Loading Cassette Deck

Sankyo's STD-1750 front loading stereo cassette deck has total automatic shut-off in addition to such other features as: dual record level controls; twin VU



Circle No. 122 On Reader Service Card

meters; three-digit tape counter; microphone and headphone jacks; super-hard permalloy heads; controls for stop, eject, record, rewind, forward, pause and fast forward; Dolby noise reduction system. The deck is powered by a mechanically-governed DC motor. Specifications: frequency response, 30 to 14,000 Hz with normal tape, 30 to 16,000 Hz with CrO₂ tape; signal-to-noise ratio, 55 dB using CrO₂ tape with filter and Dolby off (improved by 5 dB at 1 kHz and 10 dB at 5 kHz or more with Dolby on); separation, more than 30 dB at 1 kHz; crosstalk, more than 50 dB at 1 kHz; input sensitivity, less than 0.7 mV at 400 Hz with mic and less than 50 mV at 400 Hz for line-in; total harmonic distortion, less than 2.0% with normal tape; output level (headphone), 1 mV ± 3 dB (8 ohm loaded). Price: \$179.95.

Tape Switching Unit

A professionally-designed tape duplication console, model TSB-3 by Superex Electronics, is built for the tape enthusiast having two or three tape decks and who wants flexibility not normally found on amplifiers. The TSB-3 enables duplication of source material on any or all of three decks, and the duplication process can proceed while another program in the audio system



Circle No. 126 On Reader Service Card

is monitored and recorded. All operating modes are separately color coded and include: source input, dubbing bank, monitor output. The stereo design is completely passive, EMI shielded. Price: \$49.95.

Bias-Adjustable Cassette Deck

Onkyo USA's Model TA-630D stereo cassette tape deck features an "Accu-Bias" variable adjustment using a pair of reference generators to permit the user to set his own bias and equalization under actual operating conditions. Flat frequency response is established by feeding signals from the reference generator and signal to be reproduced to a meter indicating output differences on the bias signal. Through a variable bias control, this signal is adjusted to compensate for any differences until



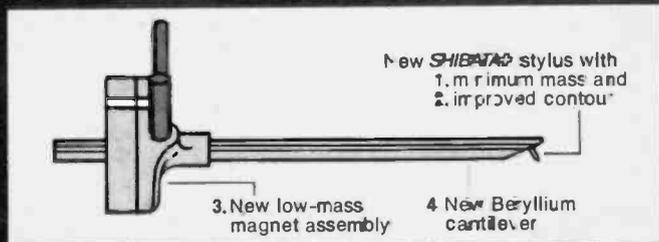
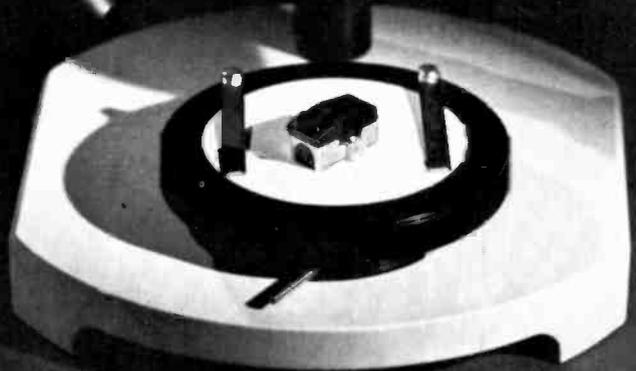
Circle No. 80 On Reader Service Card

flat frequency response is achieved. Frequency response is claimed to compare favorably with the best cassette decks available: 20 to 15,000 Hz on normal tape; 20 to 18,000 Hz with FeCr and CrO₂ tapes. Signal-to-noise ratios are a "generous" 58 dB with FeCr tape and 68 dB with the same tape using the built-in Dolby NR system. Wow and flutter is put at 0.05% WRMS nominal, and 0.06% WRMS maximum. Other features include: FM Dolby; MPX filter; memory rewind; three-position tape selector in addition to the Accu-Bias adjustment. \$350.00.

Give money.
Even more, give
understanding.

**United
Cerebral Palsy** 

Announcing four tiny advances with room-filling benefits!



In the tiny world of the stereo cartridge, microscopic differences in dimensions are all-important. Which is why the extremely low moving mass of the new AT15SS is a major achievement in stereo technology.

For instance, to the best of our knowledge our new stylus is the smallest whole diamond used in series production. In cross-section, it's 36% smaller than our best previous model. It is also nude-mounted to further reduce mass at the record surface. And the square-shank design insures exact alignment with groove modulations.

All this is so small you'll need a microscope like the one above used by many A-T dealers to see the details. If you look *very* closely you'll also see we've slightly revised the contour of the Shibata tip. The combination of minimum mass and new contour which we call Shibata+ offers outstanding stereo reproduction, especially of the latest high level recordings.

But there's more. Extremely low distortion results from a new ultra-rigid

Beryllium cantilever which transmits stylus movement without flexing. And flatter response plus better tracking is achieved by a new method of mounting our tiny Dual Magnets to further minimize moving mass.

Four tiny differences, yes. But listen to the new AT15SS or the hand-selected AT20SS for ultra-critical listening. You'll find out that less IS more. At your Audio-Technica dealer now.

Note: If you own a current AT15Sa or AT20SLa, you can simply replace your present stylus assembly with a new "SS" stylus assembly to bring your phono system up to date.



Model AT15SS
\$200.00

Model AT20SS
\$250.00

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

AUDIO-TECHNICA U.S., INC., Dept. 39BG-2, 33 Shiawassee Avenue, Fairlawn, Ohio 44313

Circle No. 8 On Reader Service Card

SOUND PROBE SOUND PROBE SOUND PROBE

It is well known that speaker specs can give you only limited guidance in choosing one which will suit your needs and tastes. Your final judgment must be made by ear. While electronic components—such as tuners and amplifiers—can be optimized by rational calculation, all kinds of imponderables stubbornly cling to loudspeakers. They represent an area of design where electronics,

mechanics, and musical instrument-building overlap. With so many different elements affecting their performance, it is hardly surprising that each speaker has its distinct tonal flavor, its own personality.

We spend lots of time listening to all sorts of music on all sorts of speakers, and we form our personal opinions of them. We try to convey impressions rather than measurements, hoping that this will help you recognize your own preferences in sound and guide you to speakers that will give you the most pleasure.

by CHRISTOPHER GREENLEAF and HANS FANTEL

Wharfedale E-50



Circle No. 130 On Reader Service Card

Description

Some twenty years back, the British Wharfedale Company hired Carnegie Hall to convince a skeptical New York audience that their speakers—among the first ever to be designed expressly for high fidelity—could come pretty close to the sound of real music. Live musicians on stage alternated with their own recordings played through a pair of Wharfedales, and even then speakers came off surprisingly well in this daring comparison with human music makers.

Concentrating on the British Commonwealth market, Wharfedale has since been absent from the American scene. The company is now staging a re-entry into the United States with a dramatically unconventional product.

Even the looks are unusual. The open-mesh grille of the Wharfedale E-50 is almost completely transparent,

revealing three drivers framed with bright metal rings gleaming against a black background and giving the E-50 the appearance of some kind of modern metal sculpture. The bass vent is also circled in metal and the hefty tweeter and midrange control knobs all add to the striking hi-tech look.

The E in the E-50 stands for efficiency—the guiding idea of its design. This speaker (and its bigger brother, the E-70) puts out more sound per watt than any other current model we have heard. It fills the room with sound with as little as 3 watts per channel. In fact, the output power meters on our Sony receiver used in these tests rarely moved above the 2-watt mark—and we certainly played it *loud!* Thanks to their remarkable efficiency—94 dB sound pressure level produced by 1 watt at a distance of 1 meter—these speakers give you the

Celestion Ditton 33



Circle No. 133 On Reader Service Card

Description

If loudspeakers can be said to have personalities, this British newcomer reminds us of those stiff-backed gentlemen seen in London's financial district, striding along as if on parade, tapping furred umbrellas and topped by a bowler. This speaker is clearly their audio counterpart: conservative, impeccable, and inobtrusive.

Given such an attitude, and a price tag of \$269.50 each, appearances matter. It is hardly surprising therefore that on the Celestion the cabinetry itself is a pleasure, with the grain matching at the edges, just as fabric patterns are matched at the seams in fine British tailoring. Even the front panel, though normally covered by a brown grille, is veneered so that the speakers can be left "naked" without the grille, if so desired. The Celestion is available in either walnut or teak, and

the teak model we tested was aglow with luxurious touches of red, yellow, and brown in its rich grain.

In keeping with the strict conservatism of this design, the speaker operates as a sealed enclosure, employing the traditional acoustic suspension principle. This assures clean, uncolored bass, however at the expense of efficiency. The manufacturer suggests a minimum of ten watts per channel for driving these speakers, but we suspect that a 10 wpc amplifier would be hard-pressed to produce sufficient volume without clipping at the peaks. To be on the safe side, we'd recommend at least 15 wpc for the Celestion. According to their sensitivity rating, it takes 5.5 watts to produce a sound pressure level of 90 dB at a distance of 1 meter, as measured in an anechoic chamber. Granted, in a normal room, with sound reflections contributing to the audible

Again we turn the world around.

The world's first pure power DC receivers, the Sansui G-line, redefined the limits of musical fidelity. Sansui's capacitor-free DC amplifier design (patent pending) with super-high slew rate, ultra-fast rise time, and full transient response, makes music sound much more true-to-life.

Now Sansui does it again. With the new G-7500 and G-5500. Using the same exclusive DC circuitry; all others are trying to imitate, these new models offer more watts per dollar than ever before.

The **G-7500** delivers 90 watts per channel, min. RMS, both channels into 8 ohms from 20 to 20,000Hz with no more than 0.025% total harmonic distortion, at a suggested retail price of only \$620.

The **G-5500**, at a suggested retail price of only \$465, offers 60 watts per channel with no more than 0.03% THD under the same conditions.

From their macro-designed power supplies, for rich full sound over the widest frequency range, to their micro-sensitive double speaker-protection circuitry, the G-7500 and G-5500 are unbeatable.

The FM sections further enhance Sansui's reputation for tuner excellence. Pinpoint selectivity and ultra-sensitivity to even the weakest signals guarantee pure and clean reception, always. And always with maximum stereo separation.

Let your franchised Sansui dealer demonstrate the comprehensive, human engineered features and controls. There's nothing in the world with quite the same feel as the Sansui click-stop attenuator and ultra-smooth tuning knob.



Now look carefully at the graceful styling, with the elegant rosewood veneer cabinet. It is setting the trend for all other receivers.

For the best receiver values, the world is now turning to the newest DC by Sansui, the G-7500 and G-5500. Shouldn't you turn to Sansui, too?



Sansui

SANSUI ELECTRONICS CORP.

Lyndhurst, New Jersey 07071 • Gardena, Ca. 90247
 SANSUI ELECTRIC CO., LTD., Tokyo, Japan
 SANSUI AUDIO EUROPE S.A., Antwerp, Belgium
 In Canada: Electronic Distributors

Circle No. 25 On Reader Service Card

SOUND PROBE SOUND PROBE SOUND PROBE

(Continued from page 26)

Wharfedale E-50



Circle No. 130 On Reader Service Card

kind of volume a from a 20-watt amplifier that you would normally expect only from a heavy-muscled 200-watt brute. So, if you like to shake walls or raise rafters—or run a disco in your basement—these speakers can save you money by letting you get by with a lot less wattage than you'd normally need. In fact, the upper power limit for the E-50 is 80 watts.

Measuring 25 x 13½ x 13¼ inches and weighing 42 lbs, the E-50 would require fairly deep and strong bookshelves, and we suspect most people will prefer using it as a floor-standing model. Bass is generated by a 10-inch woofer whose range is 55 to 800 Hz and whose output is enhanced by a vented cavity. The computer-aided design of this cavity and vent is partly responsible for the speaker's unusual efficiency.

A 4-inch cone speaker radiates the midrange from 800 to 7,000 Hz. Beyond that, a horn-loaded compression tweeter takes over, the horn being a major factor in achieving efficiency at the high end up to 18 kHz. An elaborate 5-element crossover network distributes the incoming signal among the three drivers. It is elastically mounted to prevent vibration damage.

The tweeter and midrange level con-

trols are easily accessible on the front panel and affect the ranges between 2000 and 20,000 kHz and 200 to 2000 Hz. With the controls in flat position, the frequency deviation in the nominal range from 55 to 18,000 Hz is a highly respectable ± 3 dB. Price: \$390 each.

Performance

Frankly, we were a bit skeptical about a speaker so formidably efficient. In the past, efficiency had often been gained by rather sorry trade-offs in other areas. Ultra-efficient speakers were either boomy in the bass, strident and peaky in the highs, or both. It is evident at first hearing that Wharfedale has managed to sidestep these pitfalls. The bottom is solid, without false coloration. There is none of the bloated mid-bass (circa 150 Hz) often found in inferior high-efficiency speaker, nor any of their typically 600 Hz honk. The highs, too, are remarkably clean, free from the stridency of many other horn tweeters. But for our ears (and in our room) those tweeters—despite their smoothness—seemed too bright. Some may like it that way. It certainly adds drama and punch to every musical detail. But we turned down the tweeter control all the way—for 5 dB attenua-

(Continued on page 82)

Celestion Ditton 33



Circle No. 133 On Reader Service Card

output, the sound level per watt would be higher. Even so, a little extra power reserve would be advisable with these speakers. Their maximum power handling capacity is 80 watts RMS (continuous) and the speakers will match amplifiers with outputs rated at 4 to 8 ohms.

The elegant enclosure measures 24 x 14 x 10½ inches, weighs 34 lbs., and accommodates three drivers with an overall frequency response from 25 to 28,000 Hz with a system resonance at 45 Hz. The uncommonly explicit specs also state that the maximum frequency deviation in the crucial 70-22,000 Hz range is no greater than ± 2 dB—a remarkable achievement in linearity. The specs even tell you, with remarkable frankness, that over the 40-25,000 Hz range the response is +2 dB and -10 dB.

The woofer is a 10-inch unit with a high-compliance surround, permitting long, linear cone excursions for heavy bass thrusts. The voice coil measures a generous 1½ inches in diameter to impart motion evenly to the cone, and the entire woofer assembly is contained in a non-resonant cast-metal frame. The ferrite magnet weighs a hefty 60 ounces and, with a magnetic force of 75,000 Maxwells, keeps tight control over cone

motion even at wide amplitudes.

The 5-inch midrange cone speaker is also generously dimensioned with its 1-inch voice coil and 46,000 Maxwell magnet, which may account for the notably smooth, solid midrange response. The highs are handled by a soft-dome tweeter whose particularly fine treble dispersion is detailed in a polar diagram supplied with the speaker.

Crossover frequencies, located at 500 Hz and 2500 Hz, are defined by a 12-element network comprising 5 inductors, 6 capacitors, and one resistor. According to one of the company's engineers, this configuration provides exceptionally smooth transitions at the crossover points—no peaks or dips—and thus partly accounts for the minimal frequency deviations in the overall response. There are no treble or midrange controls to alter this carefully preset balance.

Performance

The truly remarkable thing about this speaker's sound is that it seems unremarkable. We were happily unaware of any particular aspect of its total sound output. But attentive listening soon discovers rare virtues—an astonish-

(Continued on page 82)

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

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 repro-

Meet the AKG "Naturalists"

duction 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.



The Mark of Professional Quality...
in microphones, headphones,
phono cartridges, reverb units.

PHILIPS AUDIO VIDEO SYSTEMS CORP.
A NORTH AMERICAN PHILIPS COMPANY
91 McKee Drive, Mahwah, N.J. 07430 • (201) 529-3800



Circle No. 17 On Reader Service Card

pop discs

A review of the latest popular music releases

by KEN IRSAY

Barry Manilow: "Greatest Hits." Arista A2L-8601. \$12.98.

The statistics on Manilow are staggering. Twelve Top 10 singles; six albums whose total sales surpass 14 million copies; an SRO two-week engagement on Broadway plus an Emmy-award winning TV special followed by a second one garnering four Emmy nominations. Manilow's explanation for all of this: "People apparently relate to the things I sing about. We've shared common life experiences." This double-disc set includes all of his singles, plus a



number of album cuts, 19 tunes in all. In view of the above statistics, does anyone exist who doesn't already own these recorded performances?

Eric Clapton: "Backless." RSO RS-1-3039. \$7.98.

Apparently Eric has just about had his fill of being laid-back and is yearning for the good old Cream, and Derek & The Dominoes days. There's more blues and rock in this album than the ace British guitarist has played in a long time, and hallelujah for that. "Tulsa Time" and "If I Don't Be There By Morning" are the rockiest numbers. "I'll Make Love To You Anytime" just oozes with blues and features some super wah-wah rhythm guitar licks. "Roll It" reintroduces vocalist Marcy



Levy, who shared the singing chores on Eric's recent hit, "Lay Down Sally."

Gino Vannelli: "Brother to Brother." A & M SP-4722. \$7.98.

Mix a little Bee Gee-type harmony, some synthesized electric bass soul plucking, a smidgen of Samantha Sang-style vocals plus a mild disco beat and you have enough "can't miss" elements to virtually assure a hit album. This is the most appealing album ever from Gino Vannelli, whose perseverance over the years deserves to be rewarded. The album was produced and arranged by Gino, Joe and Ross Vannelli. Presumably the whole family will share the wealth.



Outlaws: "Playin' To Win." Arista AB-4205. \$7.98.

Although of southern origin this sextet plays rock with a harder edge than your typical southern boogie band. The fact that two of the six are drummers may help to explain that. This is the group's fifth album and by far their best. Vocal harmonies are tighter and more prominent and the instrumentation is more disciplined and sophisticated. The tunes are mostly up-tempo,



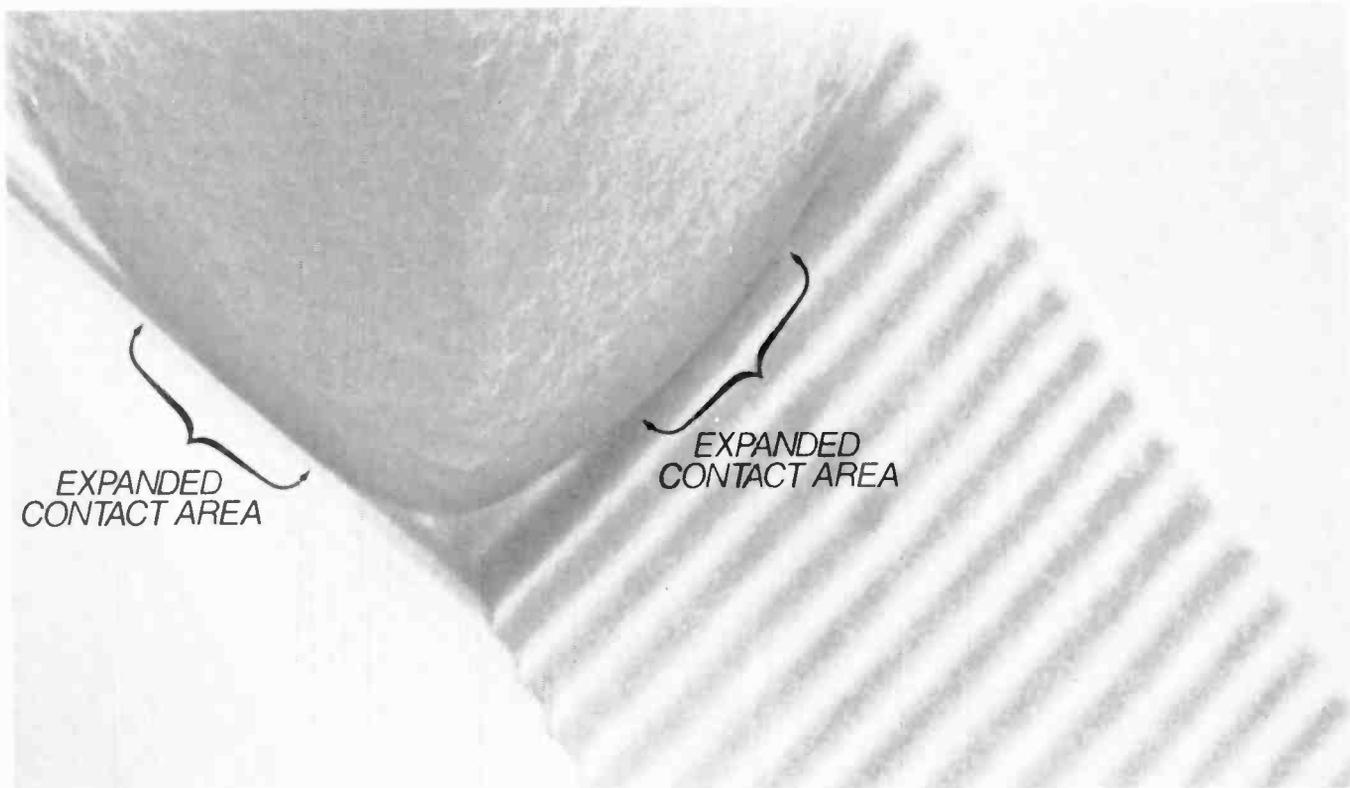
with one, "You Are The Show," beginning at a slower pace, then working up to a fever pitch with a scorching instrumental break.

Joanne Mackell: "Joanne Mackell." United Artists UA-LA878H. \$7.98.

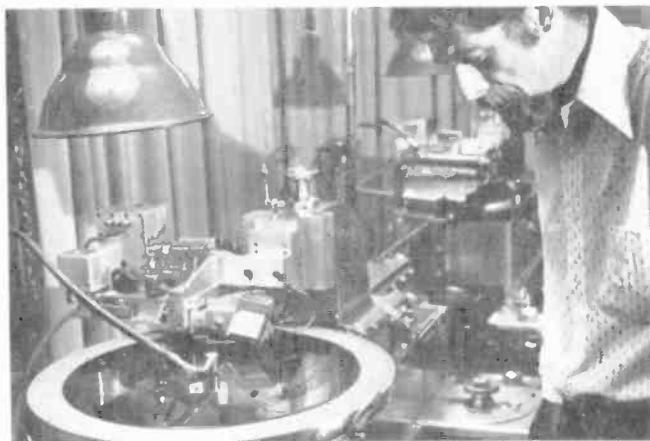
Her tiger-like photo on the album cover is a true representation of what awaits within. Mackell's deep, rough hewn voice clashes head-on with Joe Falsa's slick, tight production, making for a dramatic overall effect in this debut outing. To emphasize her "tough side of town" rock and raunch persona, she dishes out a super version of Bob Seger's "Fire Down Below," one of only two non-originals on the disc. Voice comparisons to Rod Stewart, Janis Joplin and Bonnie Tyler can easily be made.

PROFESSIONAL

The New #1 in Professional Applications....
Stanton's Calibrated 881S Cartridge



Scanning Electron Beam Microscope photo of Stereohedron stylus. 2000 times magnification. Brackets point out wider contact area.



Mike Reese of the famous Mastering Lab in Los Angeles says "While maintaining the Calibration Standard, the 881S sets new levels for tracking and high frequency response. It's an *audible* improvement. We use the 881S exclusively for calibration and evaluation in our operation."

No wonder this cartridge has achieved such dominance so swiftly. It has design, engineering and quality features that no other cartridge has. Stanton's new Professional Calibration Standard 881S cartridge is designed for maximum record protection. This requires a brand new tip shape, the Stereohedron,TM which was developed for not only better sound characteristics but also the gentlest possible treatment of the record groove. This cartridge also possesses a revolutionary new magnet. It is made of an exotic rare earth compound which, because of its enormous power, is far smaller than ordinary magnets.

Stanton guarantees each 881S to meet its specifications within exacting limits. The most meaningful warranty possible, individual calibration test results come packed with each unit.

Whether your usage involves recording, broadcasting or home entertainment, your choice should be the choice of the professionals...the STANTON 881S.

For further information write to Stanton Magnetics, Terminal Drive, Plainview, New York 11803.

© STANTON 1978



STANTON!

The choice of the professionalsTM

Circle No. 30 On Reader Service Card

**“a professional
studio recorder
with a handle”**

**“ReVox new B77 is long on
performance and short on
Mickey Mouse features.”**

That's what Herb Friedman said about the ReVox B77 in Hi-Fi/Stereo Buyers' Guide.* If you're a serious audiophile or location recordist, you'll be interested in what Herb has to say.

In addition to evaluating products for Hi-Fi/Stereo Buyers' Guide, Herb Friedman is Chief Engineer for Tridac Electronic Laboratories and a major New York radio station. As such, he produces taped programming and he knows the real differences between truly professional recorders and others that claim to have “professional features”.

Differences like 18dB record headroom, flat response with no low-frequency “head bumps”, the highest usable dynamic range and the lowest noise of any audiophile recorder. Add to these such features as all-digital-control of tape motion, large meters with LED peak level indication, self-contained tape splicer, and a rugged 37-pound package with a handle and you've got the best recorder in the world.

If you'd like to know what else Herb Friedman thinks about the B77, please circle reader service number or write to us for complete information including a reprint of his article and a list of dealers where you may see and hear the ReVox B77 demonstrated.

REVOX

Studer ReVox America, Inc., 1819 Broadway, Nashville, Tennessee 37203 (615) 329-9576
In Canada: Studer ReVox Canada, Ltd.

Circle No. 23 On Reader Service Card

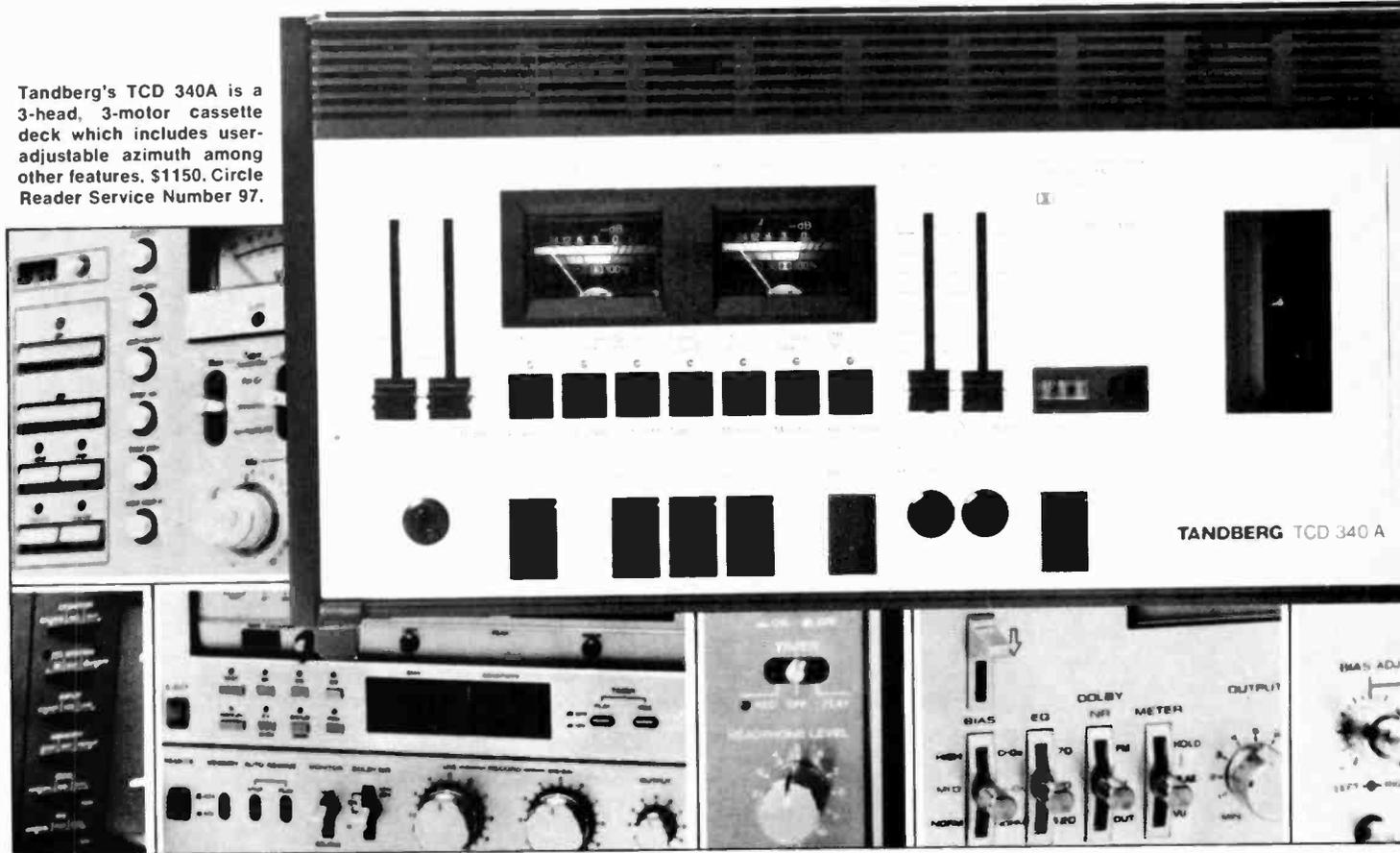
*Copyright 1978 Davis Publications, Inc. Quoted from Hi-Fi/Stereo Buyers' Guide, July/August 1978, by permission. All rights reserved.



CASSETTE DECK FEATURES

by FRED PETRAS

Tandberg's TCD 340A is a 3-head, 3-motor cassette deck which includes user-adjustable azimuth among other features. \$1150. Circle Reader Service Number 97.



DOZENS OF OPTIONS ARE AVAILABLE FROM
VARIOUS MANUFACTURERS. HERE ARE SOME TO LOOK FOR

Your first reaction to a big display of state-of-the-art cassette tape recorders might be in the form of a flashback—a vision of yourself as a child standing before a huge candy counter with weekly allowance in pocket, wondering what to buy. Everything in the display looks good, fascinating, tempting.

But there's a difference; candy is a momentary pleasure and quickly disappears. A cassette deck is for years of pleasure. And as such requires more in the way of evaluation before spending your allowance. Let's take a look at some of the features/ingredients of today's cassette equipment, to help in your evaluation, so

that you'll buy right and guarantee those years of pleasure.

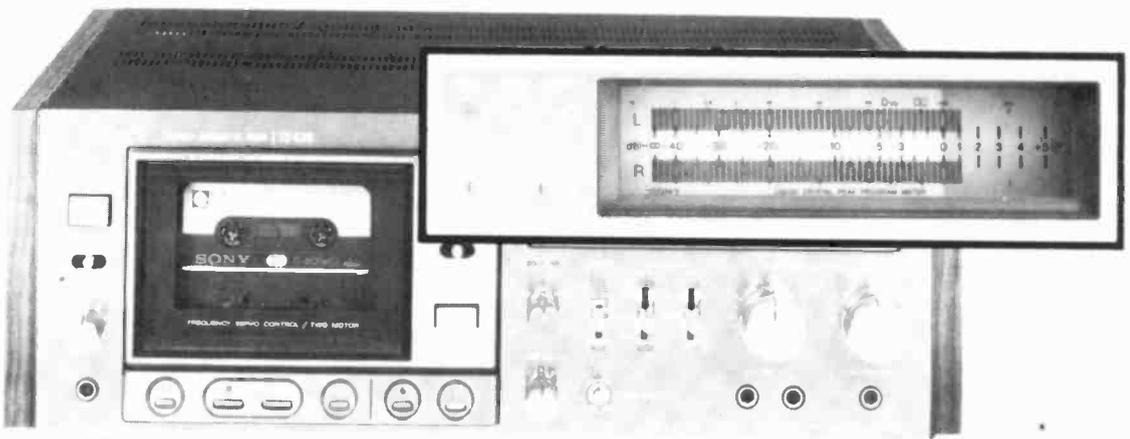
By far in the majority are front-loading cassette decks—a result of what previous generations of cassette deck owners have indicated is the handiest approach to cassette insertion and removal.

For those who prefer to install a deck atop a piece of furniture, there are still a few top-loading models in the marketplace.

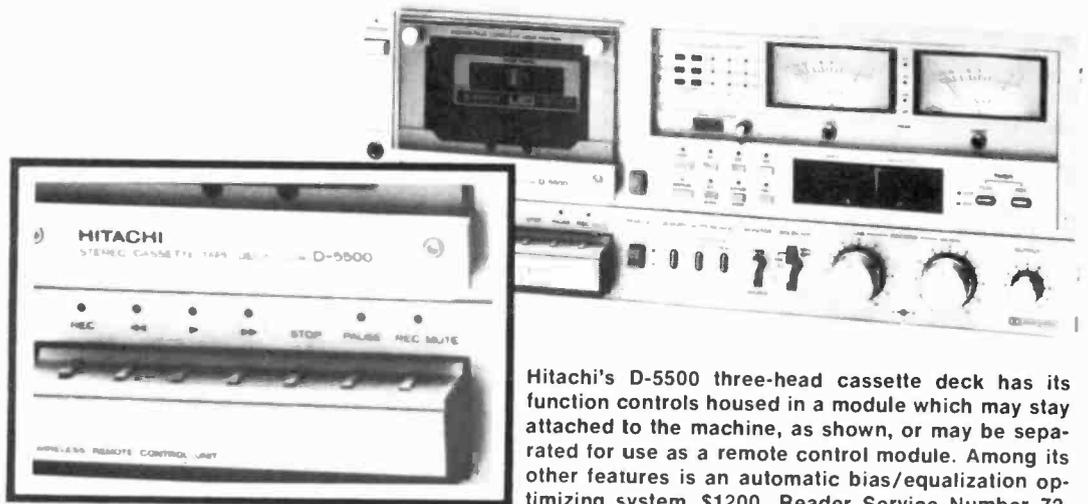
Once you've decided on which of these two types to buy, and how much you want to spend, your next decision will center around what you will do with the equipment. If you intend to do casual non-critical record-

ing from a receiver (radio programs, or phono records played through its amplifier), or voice recording at home via microphones, you can get along nicely with a *basic* model.

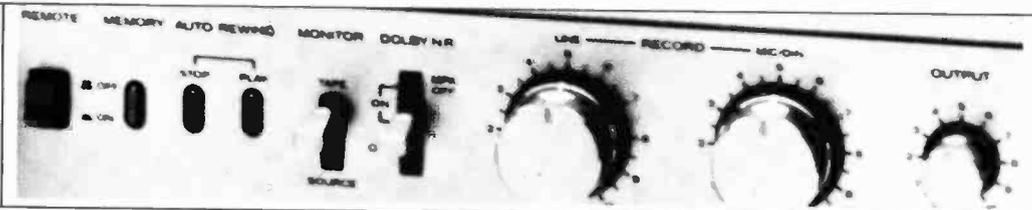
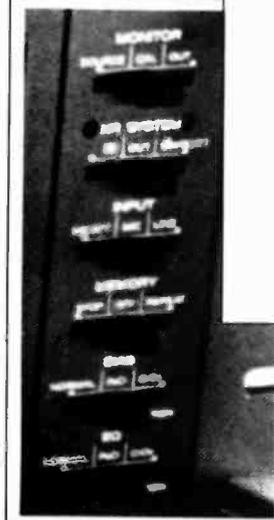
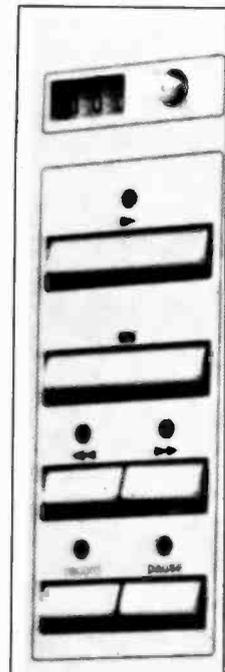
You'll find such units priced from about \$150 to about \$190 in the Fisher, U.S. Pioneer, Sony, Sanyo, Marantz and Superscope brands, and around \$200 in the Akai, JVC, Philips, Scott, Technics and Toshiba brands. Typical of this group is the U.S. Pioneer CT-F500 at \$175 that offers front-loading operation, Dolby noise reduction, two VU meters, three-position tape selector, headphone and microphone jacks, digital counter, and a full complement of transport controls,



Sony's TC-K8B cassette deck is a two-head machine which features liquid crystal display record level meters. The meters are peak-reading-type, with a manual and automatic peak holding option. Mode selection is solenoid-assisted. Other features include Rec-Mute switch, FM multiplex filter, headphone level control, timer option. About \$850. Reader Service No. 94.



Hitachi's D-5500 three-head cassette deck has its function controls housed in a module which may stay attached to the machine, as shown, or may be separated for use as a remote control module. Among its other features is an automatic bias/equalization optimizing system. \$1200. Reader Service Number 72.



CASSETTE DECK FEATURES

including pause and automatic shutoff.

Such machines can produce excellent recorded tapes and do a fine job of playing back those tapes—as well as commercially recorded tapes and those of friends and relatives. The average listener would be hard put to hear any significant difference between the tapes made on such units and those costing far more.

But, if you are somewhat critical, and if you expect to be more than casually involved in tape recording, you'll be after certain conveniences and features to make the job easier, more pleasant, and likely to attain optimum results. In this case, the sky is the limit, with cassette decks ranging all the way up to over \$1,000 in the Tandberg, Eumig, Denon, TEAC, Technics and Nakamichi brands.

While deluxe, "super" models are desirable for certain specialized attributes—and "image" status, they are not always *audibly* superior to models at half their cost. For example, one unit

priced over \$1,200 in a certain brand has a wow/flutter spec of 0.4 per cent, while another in the line priced at \$550 has a wow/flutter spec of 0.05 per cent. Is that *inaudible* (to even superior ears) increment worth over \$700? Hardly! Here's another example; One model priced beyond \$1,300 has a signal-to-noise (S/N) ratio spec of 65 dB, while another unit in the same brand with S/N spec of 64 dB is only \$450. Again, the difference is inaudible, even to a super critical listener. And there are cases where a lower priced model in a given brand offers *better* specs than the top priced model. (This



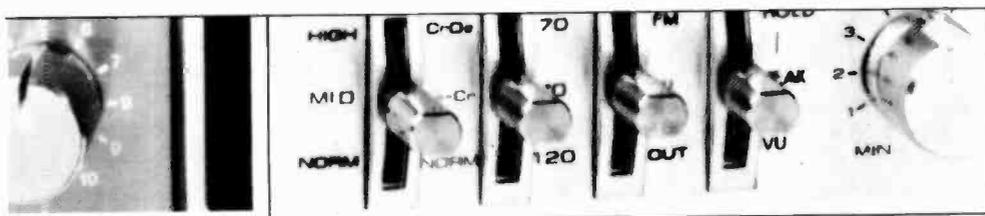
TEAC's C-1 cassette deck includes a tape/source monitor, built-in Dolby/outboard dbx selector, memory rewind which gives you the option of stop or replay after rewind, 3-position bias/EQ selectors which include the option of using plug-in modules designed for use with high bias tapes. See Test Report section for a full report. \$1300. For details circle Reader Service Number 10.



Mitsubishi's tiny M-T01 cassette deck measures a mere 10 5/8 inches across the front-panel, yet its features include peak reading, a record/play switch for use in conjunction with an external timer, a memory function which allows you the choice of stop or replay after rewind. See Test Reports section for details on this \$560 unit. Reader Service No. 78.



Kenwood's KX-1030 three-head cassette deck offers 3-position bias/EQ selection, coupled with user-adjustable bias fine tuning and a built-in bias calibration system. \$450. Circle Reader Service Number 75.



reverse situation is quite prevalent in reel equipment, where models meant for the audio consumer market are better spec'd than the models in the same brand meant for professionals—radio stations, recording studios, etc. In such cases the key to the higher price is the professionals' need for heavy duty, rugged construction for around-the-clock operating reliability, rather than a miniscule—and inaudible—spec improvement.) Thus, in determining what you will buy, let the accent be more on operating features than on specs—unless the differences in specs result in audibly superior

recordings. Basically, the more features you can get for your dollars, the greater the operating flexibility you'll have, and the greater your ultimate satisfaction.

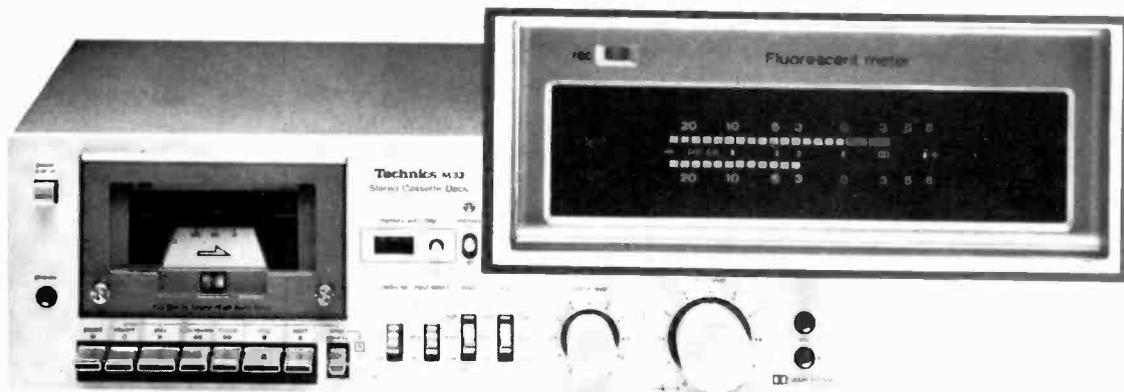
Solenoid Controlled Transports. One consideration in buying a better cassette deck is the "feel" of the transport controls. Some machines have function controls that require a bit of exertion and take some concentration. Some controls are smooth and easy to operate. And still others need barely a touch of a finger to move into operation. The latter are usually solenoid-logic types that come at a

higher price. If you like silky smooth operation you're likely to succumb and pay the extra money. You'll find solenoid-controlled transports in decks from Eumig at \$1,300, Sansui at \$600, Sony and SAE at \$400, Hitachi at about \$380, and Sharp at \$339.95, as well as at various other prices in at least twelve other brands.

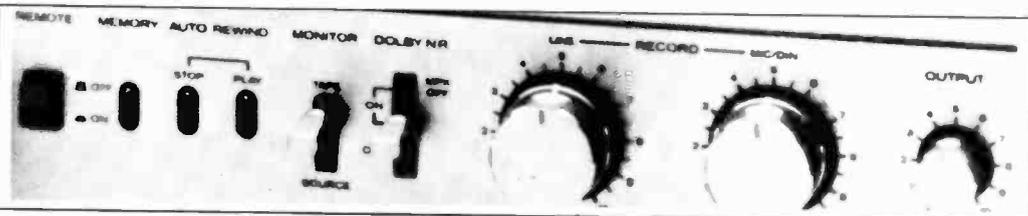
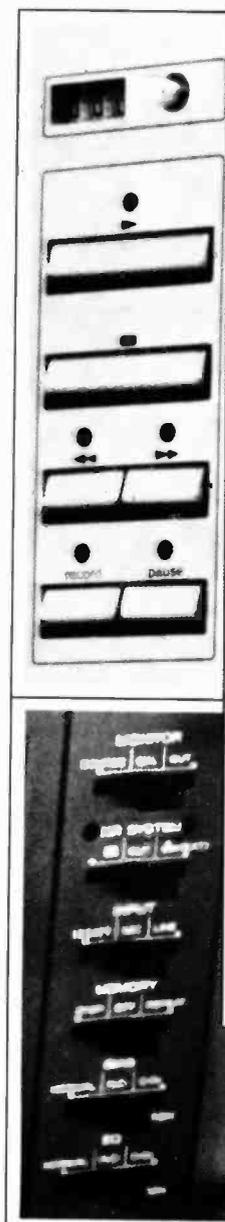
Peak-Reading Meters. Many audio buffs and recordists are "needle watchers" who derive pleasure from watching the pointers of VU meters responding to input or output signals while operating their equipment. But meters serve a more important function



Rotel's RD-2200 cassette deck has three-position bias/EQ selectors and fine-tune bias adjustment for normal bias tapes. LED peak indicator, record mute, and headphone level control are all among its features. A complete test report may be found elsewhere in this issue. \$430. For details circle Reader Service No. 87.



Technics M33 cassette deck includes a fluorescent peak indicating meter whose brightness may be adjusted v.i.a a knob. Also incorporated are a timer standby mechanism, cue/review capability, and a memory function which allows programming for rewind to a designated portion of tape and then either replay or stop. \$350. Reader Service No. 98.



CASSETTE DECK FEATURES

—they are the key to successful recordings. If you are after top results look for level meters that indicate *peak* as well as *average* readings of the signals that are being recorded. If your choice boils down to two machines of equal merit in terms of features but one has combination peak/average reading meters at an increment of, say, \$50, spend the extra money; you'll

be glad you did.

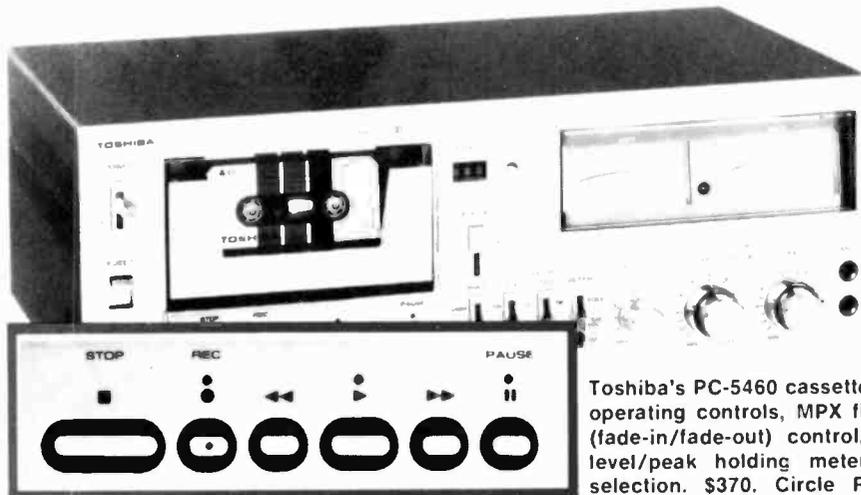
LED or Fluorescent Readout. In any up-to-date display of cassette equipment you'll be certain to see models that have not only level meters but also LED or fluorescent level readout systems, or just LED or fluorescent readouts. These are the latest readout systems, and generally they are superior to the average VU meter system. One of the most intriguing of these appears in JVC's Models KD65 and KD85, priced at \$400 and \$500 respectively. It is called the "Spectro Peak Indicator" and consists of LEDs arranged in vertical bars of five

frequency ranges: 100, 300, 1,000, 3,000 and 10,000 Hz. Their dynamic range is indicated in increments of plus 6, plus 3, zero, minus 5 and minus 10 dB. This permits a cassette recordist to visually monitor the high frequency peaks that are likely to cause distortion. He is immediately warned of distortion before it occurs, and can make appropriate adjustments to prevent it. Since the Spectro Indicator has 25 peak-reading LEDs (each one responding within one millisecond), he has much more control than if he depended on VU meters alone. An LED's rise fall time is 300 times

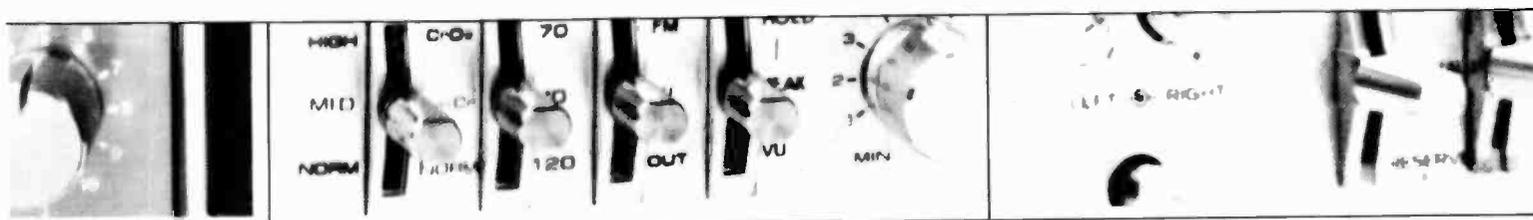


Sansui's SC-5100 cassette deck features solenoid-logic-controlled tape modes. Pushbuttons control memory, automatic play, automatic repeat, timer record, timer play, and tape lead in (for quick bypass of tape leader). About \$700. For details, circle Reader Service No. 89.

JVC's KD-A8 cassette deck offers the so-called B.E.S.T. (bias/equalization/sensitivity/total) automatic tuning system which utilizes microprocessor circuitry to analyze the tape. Among its other features are switches for timer standby, memory stop/play, and record mute. \$750. Circle Reader Service Number 74.



Toshiba's PC-5460 cassette deck includes feather-touch operating controls, MPX filter switch, automatic editor (fade-in/fade-out) control, switch-selectable VU/peak level/peak holding meters, and 3-position bias/EQ selection. \$370. Circle Reader Service Number 99.



quicker than that of an ordinary VU meter. The JVC multi-LED peak indicator, claims JVC, can also respond to brief-duration pulsive signals and register them accurately, while VU meters cannot. In playback, the Spectro Indicator displays the frequency spectra of the reproduced music, showing if the music is bass-rich, treble-rich or combinations thereof. (It is fascinating to watch). The unit also has two VU meters as a back-up or extra reference point in the recording process.

You'll find LEDs for peak level reading in several other cassette

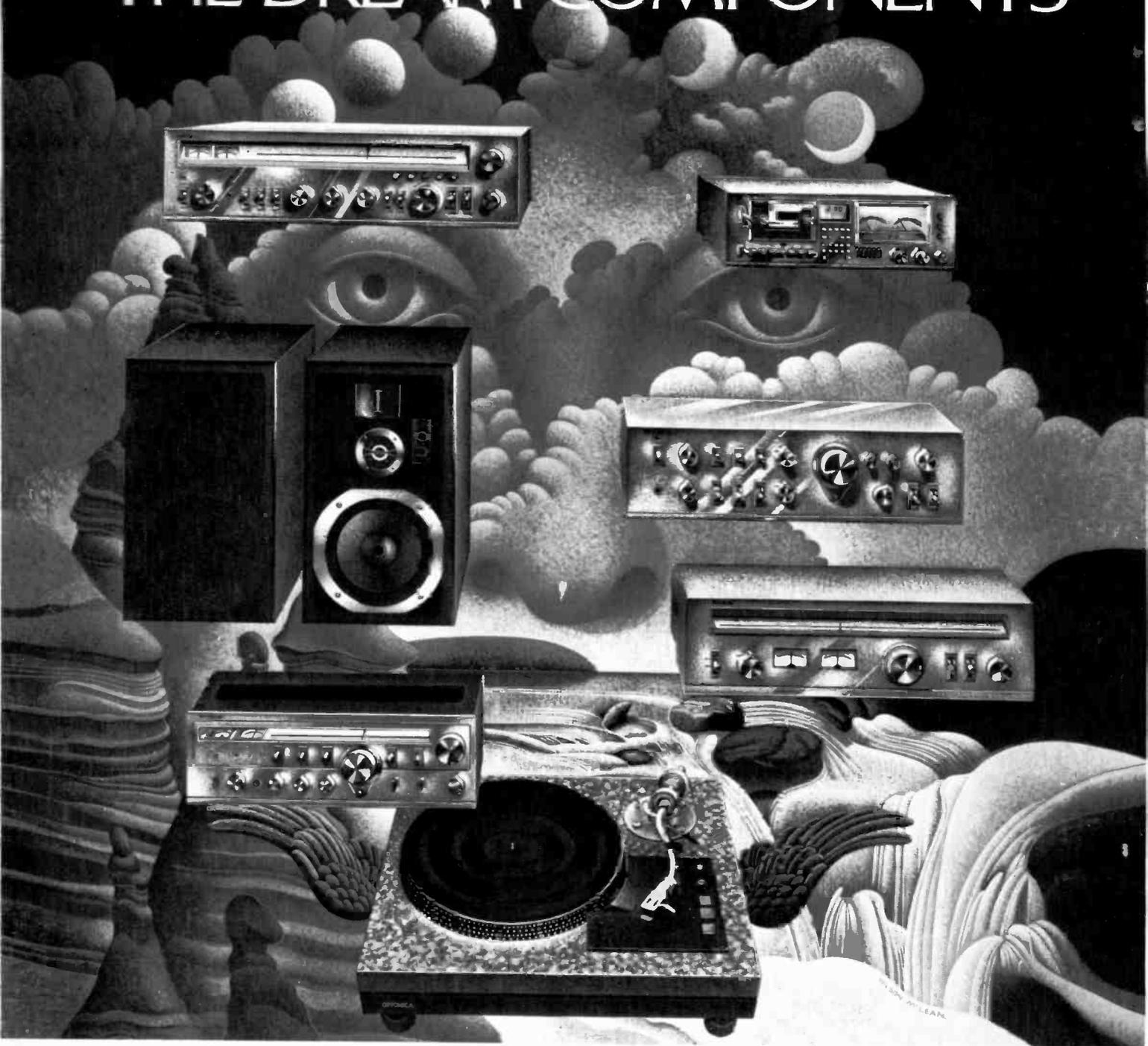
decks. Dual, for instance, uses two banks of 12 LEDs in a single plane, one row for each channel, in its Model 939 at \$580. Rotel uses two rows of 13 LEDs each in a bar graph arrangement in its Model RD-2200 priced at \$430. LEDs are also used in Eumig's deluxe top-loader Model CCD priced at \$1,300 in a double vertical line arrangement, and similarly in B.L.C.'s new Model T-4 at \$849.95, a dual-speed model that features digital LED readout in half-inch-high numerals of tape run-out.

Coming on strong this year is the fluorescent type of recording level

indication. Technics in its brand new Models RS-M95, M22, M44, and M33 at \$1300, \$300, \$400, \$350 respectively, is among the latest to utilize fluorescent metering. The M-95 offers true peak indication in a range of minus 40 dB to plus 8 dB deviation from the zero dB level. The other three offer a scale of minus 20 dB to plus 8 dB. Hitachi's Model 560 also uses fluorescent readout, in a double bar graph arrangement in a minus 20 to plus 8 dB range, at about \$300. And so does Pioneer's CT-F900 at \$575.

(Continued on page 75)

THE DREAM COMPONENTS



A tape deck that thinks, a turntable steady as a rock, a receiver that protects itself, and more.

In your dream you hear beautiful music coming from a high fidelity system. All the components have the same name on them.

Impossible? Only if you believe there's one "best" maker for each type of component. Once, perhaps. But today no one has a monopoly on technological excellence. You'll find the Optonica® name on entire systems of the world's most advanced components, with innovations—our own

new circuits and features—you might expect to find only in a dream.

In a dream you might own the amazing Optonica cassette deck that contains a small computer. You can program it to control endless recording and playback functions. It would be a fantastic deck even without its own computer.

In the same dream you could have the Optonica turntable with a beautiful base that looks and feels

just like granite. It is, in fact, mikage granite, which will transmit exactly the correct amount of vibration to the tone arm: *none*.

You might furnish your dream with a new Optonica receiver or separates, the only ones in the world built with aircheck calibration, Opto-lock tuning, triple power supply designs, and three protection circuits.

Now the same source also produces some of the most accurate speaker systems in

history. Optonica CP-5151's incorporate a unique new tweeter. It weighs just about 1/50th as much as a comparable "dome"-type tweeter, and its sound is incomparable.

Listen to a system with one name: a dream system, only at an Optonica dealer.

OPTONICA

THE OPTIMUM

10 Keystone Place, Paramus, N.J. 07652



BLANK CASSETTE TAPE

KEY ADVICE: DON'T BUY CHEAP

by FRED PETRAS

Rubbish tapes can make even the best system sound like . . . yes, rubbish." "It is quite easy to degrade a cassette deck that costs hundreds of dollars so that it is on a par with a unit selling for less than fifty. Just use the wrong tape. No deck can be better than the cassette put into it."

These two statements—taken from promotional materials of two major tape manufacturers—are right to the point, and might well be heeded. However, picking the right tape for your bright new cassette deck can be somewhat of a hassle, compounded by a variety of designations for what are essentially the same tapes, spec sheets that leave out important information, and high-

flown claims that leave you with the impression that every tape is superior, and better than all the other superior tapes.

In addition, you'll often find tape pricing to be a matter of local market conditions, with pricing in one brand at any given time to be totally unrelated to the pricing of comparable product in another tape line—all of which leaves you wondering just what sort of quality or performance can you expect for your money? (In some stores, blank tapes are promoted on a "Weekly Special" or "Monthly Special" basis, reflecting the latest giveaway deal of manufacturers.

Further, in many stores that sell tape you'll find sales



TDK's AD tape is available in 45-, 60-, 90-, and 120-minute cassettes. Intended for use in the *Normal* bias position, price of a C-60 is about \$2.90.



Master I tape from Scotch operates best in the *Normal* bias position. Available in 45-, 60-, and 90-minute lengths, with the option of C-box packaging for 40¢ extra. C-60's are about \$3.50.



Maxell's UD/XL I cassettes come in 60- and 90-minute lengths, with the 60-minute version going for about \$5.00. Designed to be used with bias in the *Normal* mode.



BASF's Professional I cassette tape comes in 60- and 90-minute lengths, and is meant to be used with the *Normal* bias setting. Price of C-60: \$3.30.



Fuji's FX-1 cassette tape is used in the *Normal* bias position and is color-coded silver for easy identification; A C-60 sells for about \$4.50.

Memorex offers MRX, *Normal* bias cassette tape in 30-, 45-, 60-, 90-, and 120-minute lengths. Price of the C-60 is about \$2.70.



NORMAL BIAS

CASSETTE TAPE

personnel singularly lacking in knowledge of the tapes they are selling, or confused by the multiplicity of formulations, leaving you to make your choice unaided.

All of which suggests that the blank tape industry has left the consumer in somewhat of a stranded position.

But you needn't be stranded. Read on for some guidelines that can help you in your quest for the right tape for your needs.

First off, be assured that regardless of what "legitimate" brand cassette you buy, you'll be able to get at

least decent results on your machine because of the tape recorder's tape selector. Most of today's cassette decks have individual two or three-position tape selector switches for both recording bias and playback equalization settings. If not, they have switches that combine these functions.

The three-position switches relate to the three basic tape categories—those which require *normal* bias (many are ferric oxide formulations), those which require ferrichrome bias/EQ, and those which require *High* bias (including chromium dioxide formulations). Machines of the future will probably have a fourth position, for metal particle tapes, which we'll discuss later. The two-



Maxell's UD/XL II (left) is a chrome-type tape which requires *High bias* for optimal performance. C-60's go for about \$5. C-90's are also available.

Scotch offers Master II cassettes at about \$4.20 for a C-60. 45- and 90-minute lengths are also available. High bias setting should be used.

TDK's SA cassette tape is designed for use with *High bias* setting. Available in 60- and 90-minute lengths, the C-60 cassette costs about \$3.70.



BASF's *High bias* tape is Professional II. It comes in 30- and 90-minute lengths, with the C-60 priced about \$3.50 each.



Sony's EHF cassette tape is intended for use in the *High bias* position. The 60-minute cassette sells for about \$3.90. 45- and 90-minute cassettes are also available.

Fuji's *High bias* tape, FX-II comes in a gold color-coded package. Playing times of 46, 60, and 90 minutes are made. The approximate price of a C-60 is \$4.60.



HIGH BIAS

position switches generally cover ferric oxide tapes under one setting, usually designated "Normal" or "LH," and chromium bias tapes under the other, generally designated "CrO₂."

Ferric oxide tapes (the biggest general category) are best described as "basic," and encompass the full gamut of recording needs, in a wide range of grades in a wide range of prices. You can select "economy" or "utility" tapes in this category that give first-class results in voice recordings, be they drama readings, dictation, or the sounds of a birthday (or any other) party. On the other hand, you'll find some tapes in this group that cost a bit more and do a good job of recording music for "back-

ground" or non-serious, non-critical listening purposes. And you'll find ferric tapes of superb quality that do an excellent job for serious, critical listening. Some of these tapes are worthy of the designation "professional" in terms of quality music recordings that offer excellent signal-to-noise ratios, wide frequency response, high saturation capability, good dynamic range, and a low order of dropouts and print-through.

A rule of thumb in buying ferric oxide tapes is that, generally, the more you pay the better the quality of recordings you'll obtain. The higher priced tapes reflect greater care in manufacturing, better mechanical parts and construction, better film bases, and finer oxide

Scotch offers one high fidelity cassette designed specifically for use in tape machines set to the FeCr bias position: Master III. The 60-minute tape sells for about \$4.20, and 45- and 90-minute cassettes are also available.



BASF's Professional III cassette tape is meant to be used with your tape machine set to the FeCr bias position. A 60-minute cassette costs about \$3.50. 90-minutes are also available.

Sony's cassette tape for use with the FeCr bias position is called FeCr. Available in 46-, 60-, and 90-minute lengths. The C-60's price, \$4.60.



FeCr BIAS

CASSETTE TAPE

particles—the latter essential for superior high frequency response and signal/noise ratios. Better mechanical parts and construction are designed to assure trouble-free operation of both tape and deck—avoiding tape snarls that can jam a machine to a dead stop.

You'll run across various designations in this category of tapes, but don't let them confuse you. You'll hear expressions for oxides such as iron, carbonyl iron, pure iron, alpha-ferric, pure ferric, ferric-ferrous, gamma-ferric, gamma hematite, Berthollide iron oxide, etc. Whatever they're called, they're still basically ferric oxide tapes.

Ferric oxide tapes as a rule are used with the bias setting on the cassette decks at the "Normal" or "LH" position. The playback equalization setting is 120 microseconds (which may or not be indicated as such). If they incorporate cobalt in the oxide formulation, they may use the high level bias setting appropriate to chrome tapes, and a 70-microsecond playback equalization setting. (Study your cassette deck's operating manual to determine its particular bias and equalization settings.)

Among key brands of ferric oxide tapes (including formulations containing cobalt) are Ampex (four series),

BASF (four series), Capitol (one series), Denon (two series), Fuji (three series), Irish (two series), Maxell (three series), Memorex (one series), Nakamichi (three series) Realistic (three series), Scotch (three series), Sony (two series), and TDK (four series).

Ferri-chrome tapes are, essentially combination tapes, offering the best of two worlds to the critical music recordist. They provide the bass and mid-frequency recording capability of ferric oxide tape with the high frequency recording capability of chromium dioxide ("chrome") tapes. These tapes are generally made up of a thin layer of chromium dioxide on a thicker layer of ferric oxide on a film base, usually mylar or polyester. Each company has its own ideas on just how much of each oxide type should be used.

Some companies claim that their ferri-chrome tapes are superior to chrome tapes, in that they provide a better balance of low, mid and high frequencies, for a "flatter," more accurate frequency response.

Ferri-chrome tapes have an individual bias setting for them on modern cassette decks. The bias/equalization setting information is sometimes given on the index sheet accompanying a tape, sometimes on the master carton that holds a dozen tapes. If it isn't, ask the salesman

(Continued on page 77)

MOVING UP TO BETTER COMPONENTS

A STEP BY STEP GUIDE TO IMPROVE YOUR CURRENT SYSTEM

by WILLIAM S. GORDON

There are two good reasons for being into high fidelity. One, you're interested in sound *quality*, not cacophony, and, two, you want to be able to swap components without going to the cleaners. One of the prime advantages that component hi-fi has to offer is the ability to improve your system piecemeal—no need to chuck it all into the trashcan and start over from scratch.

What is the impetus that causes an audiophile to pour over spec sheets, magazine reviews, and advertisements? A constant search for sonic perfection—as elusive as a poltergeist but much more real. Although the recreation of an orchestra or band in our living rooms is illusory, high-quality sound is not. It is real, and can be quantified, specified, measured. And it is the quest for ultimate realism that spurs us on to upgrade our systems.



Whether the initial shock that jolts you into the dealer's showroom is an advertisement, a technical review, or just having heard a better system at the Jones' is incidental. Once the bug bites, the itch must be scratched. So what are the recent innovations in high-fidelity componentry, and what should you be looking for in your search? Here's a component-by-component rundown of things to consider when upgrading.

Amplifiers

What's new in amplifiers? Compared with the past, we're seeing more power amps, integrated amps, and receivers with some sort of an output-power indicator. Some use meters, some a series of LEDs. The meters may indicate either the peak or the average power you're delivering to the speakers. (Actually, they really measure the output voltage, and the power indication is only accurate if



BETTER COMPONENTS

you are using the load—usually 8 ohms—for which the meters were calibrated.) The LEDs almost invariably are peak-responding devices.

Useful? A matter of opinion. Personally, I see little value in average-responding meters for this application. Some indication of the point at which you're approaching the maximum capability of the amp would seem to be of value. A couple of LEDs would suffice—one to indicate the overload point, the other to tell you when you're getting close. Other than that, power-output indicators strike me as more cosmetic

than practical, but to each his own.

In circuitry, we're seeing a few more power-FET amplifiers—generally very expensive. The theoretical advantages are a faster switching speed and lower inherent distortion. So chalk up a more extended frequency response and the promise of a lower degree of high-frequency distortion for these goodies.

We're also beginning to see a few amps with "switching power supplies" if not full Class D (switching-amplifier) operation. Result? Higher efficiency and a better-regulated supply more impervious to low line-voltage levels. However, the better regulated the supply, the less dynamic headroom is available so you'll have to concentrate on the continuous-power rating when comparing these amps.

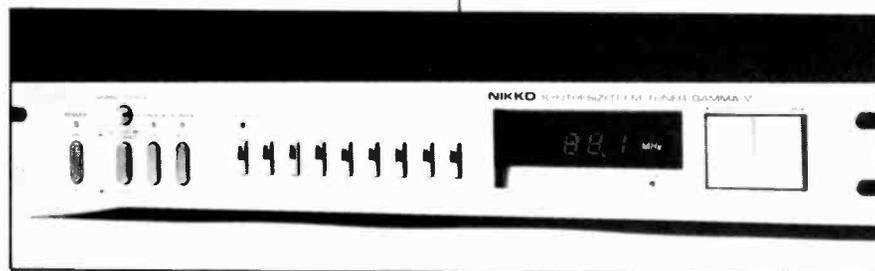
The two other new "classes" of amplifiers—G and H—remain pretty much the province of their inventors—Hitachi and Soundcraftsmen, respectively. There is, however, a minor resurgence

of interest in Class-A amplifiers and some firms are putting out modified-Class-A designs that claim higher efficiency—the lack thereof being the bane of Class-A stages—while maintaining their low-distortion characteristics. Don't expect them to be cheap.

You'll also likely hear a lot of noise made about slew rates, rise time and TIM as well as about DC coupling. Slew rate tells you how quickly the amplifier will respond to an instantaneous change in input level. It's generally given in "volts per microsecond," and a spec of 50 volts per microsecond means that the output can shift 50 volts within one-millionth of a second. The higher the power output of an amplifier, the more rapidly it must "slew" to keep up with a rapid change in signal so this is a spec that must be interpreted in light of the amp's power rating. (This is the reason the IHF chose *not* to bless slew rate itself in the new standard.) For every quadrupling of amplifier power, the slew rate must double just to keep up. Rise time is a related spec but specifies only the *time* required to get from the 10% point to the 90% point. Whether the amplifier

RECEIVERS & TUNERS

Yamaha's CR-3020 AM/FM receiver incorporates a 160-watt-per-channel amplifier section. Among its features are built-in head amplifier for use with moving coil phono pickups, peak-reading meters, dual-range low and high filters, dual-range bass, midrange and treble turnover frequencies. \$1400. No. 101.



Nikko's Gamma V FM stereo tuner has an approximate price of \$650. It has a two-stage PLL synthesized digital tuning system, an adjustable muting threshold, wide/narrow bandwidth selection, six station memory, and an automatic scanning feature. For details circle R. S. No. 79.

ReVox offers this B760 FM stereo tuner with digital frequency synthesis at an approximate price of \$1150. Its convenience features include Dolby noise reduction, muting mode selection, separation selection, and 15 programmable station memories. Circle No. 86.



can do its thing with equal dispatch when pumping out the watts is problematic. Rise-time measurements are usually confined to small-signal operation.

The interest in slew rate and rise time stem from the "discovery" of TIM—transient-intermodulation distortion—and its progeny SID—slew-induced distortion—and other related males and females of the distortion family. What it all boils down to is that, if an amplifier cannot follow a rapid change in signal, it *may* instantaneously overload and create a burst of distortion even though it hasn't reached maximum power.

But there is a pitfall in the reasoning. An amplifier may not have the world's greatest slew rate and still not generate TIM. In fact, one of the best ways to prevent TIM, SID, and the other youngsters is to *purposely* limit the slew rate in the early stages with a low-pass filter. Final slew rate won't be any great shakes, but the power stages will be able to keep up with anything they see, and so they won't generate transient-intermodulation distortion. And where do you expect to find step-

like changes in music signals? They're generally filtered out by the recording medium anyway.

A "DC" amplifier can mean two things—"directly-coupled" or "capable of responding uniformly to direct-current signals." Directly-coupled means that no coupling capacitors are used in the signal chain (at least in the power-amp section). Frankly, most modern circuits are designed in this way so it's not exactly a dramatic breakthrough.

Amplifiers capable of flat response to DC inputs (0 Hz) are also called by the same name. Presumably, the advantage is perfect phase linearity at low frequencies but it's hard to imagine how low-frequency phase shifts could be audible. And, should the amp supply a powerful direct current into your speaker, you'll soon be out looking for a new speaker. So, most DC amps have a switch to provide an "AC-coupled" mode. That's the one you should use for safety so what's the big advantage of a

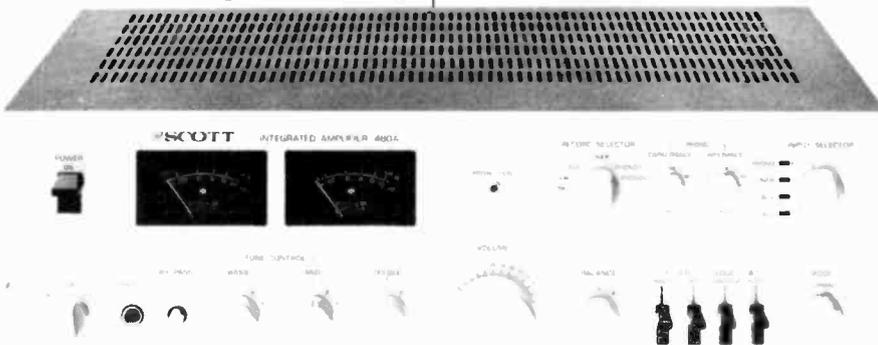
feature you'll never use?

Tuners

The newest trend in tuners seems to be toward one of another means of automatic frequency control. Sorry, that's the old-timer's phrase. Now, it's called quartz-locked tuning or by some other phrase that implies chronographic precision. And, frankly, the new circuitry is much better than the old type that tended to "pull" toward or lock onto a strong station whether you wanted to listen to it or not.

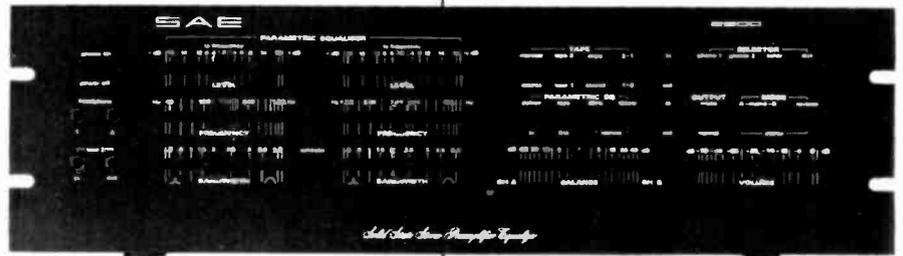
The new automatic-tuning circuits can be a valuable means to assure that your tuning is virtually perfect even if you're a little clumsy with the knob. With some designs, the tuner will lock only on precise multiples of the 200-KHz channel spacing used in the U.S.

AMPLIFIERS



Scott's 480A integrated amplifier offers a rated power output of 85 watts RMS per channel with .03% total harmonic distortion or less. Included in its features are phono pickup impedance and capacitance selectors, subsonic and high filters, bass, midrange, and treble controls. Price: about \$400. Circle Reader Service No. 90.

Technics' SU-8099 integrated amplifier has a rated output of 115 watts per channel RMS, with no more than .007% THD. Included in its array of features are three-position bass and treble turnover frequency switches. \$1000. Circle R. S. No. 98.



SAE combines a preamplifier and a parametric equalizer in its Model 2900. In addition to providing flexibility in program tone control, the parametric equalization circuit may be switched in between the source and the tape machine for use while tape recording. About \$500. Circle R. S. No. 88.



BETTER COMPONENTS

With these tuners, you can be assured that the tuning is dead accurate, and there is no need for a conventional tuning meter. These tuners afford virtually the same precision as a digitally-synthesized design and at less cost. Of course, the ultimate is still the digitally-synthesized tuner and more of them are coming on the market too.

Other increasingly popular tuner features are automatic scanning and preset capability. Although these used to be pretty much the province of a digitally-synthesized tuner, there are now more conventionally-designed tun-

ers that afford the same features. If the majority of your listening is confined to a handful of stations, it's nice to be able to select your druthers instantly at the press of a button, and, there is a certain appeal to pressing a button and have the machine automatically scan the stations for you. It *will* impress the neighbors!

PLL multiplex decoders are now almost standard. They provide much better stereo separation than the older designs, and, if your old tuner lacks this innovation, it may be time to take the plunge. New tuners also afford better suppression of the pilot and subcarrier signals that can play havoc when you're recording off the air. If your tapes now have bird whistles instead of music, or if they sound duller (in the Dolby mode) when recording a broadcast than a disc, it's time to step up. Some of the new tuners remove the pilot by cancelling it out rather than by using a filter. The advantage claimed is a bit

better high-frequency response.

Another increasingly popular tuner feature is selectable bandwidth. In designing a tuner, the engineer must make a trade-off between low distortion, good capture ratio, and good stereo separation on the one hand and high selectivity and sensitivity on the other. High selectivity and (to a lesser extent) sensitivity are achieved with a narrow IF bandwidth but this degrades the distortion (especially in stereo), capture ratio and separation specs. By affording a choice of bandwidths, the designer lets *you* choose the best combination for your situation—high selectivity if there is a station on a proximate channel, low distortion if you're in the clear. In my experience, some designers have selected the two bandwidths with more insight than have others. With some designs, the wider bandwidth is so broad that it seldom can be used, while the narrow one is so tight, the distortion is excessive. Check the specs carefully.

Tape Recorders

Cassette is obviously "king of the hill." Open-reel is alive, and, thanks to the die-hard enthusiast, will remain so.

CASSETTE DECKS

B.I.C.'s T-3 cassette deck is a three-head machine which operates at two speeds, 1½ and 3¾ inches per second. Other features offered by the T-3 are memory rewind and an LED indicator which glows green while recording at "safe" levels, but glows red as recording levels approach 3% THD. About \$500. No. 65.



Pioneer's CT-F900 cassette deck features a microprocessor-controlled fluorescent record/play level display. Digital tape counter with memory/repeat capability is also included in the three-head machine, as is a user-adjustable bias fine tuning control. \$500. Circle R. S. No. 85.

Optonica's RT-6501 cassette deck includes a microprocessor which allows you to program it to turn itself on and off, to find a particular song on a cassette and play it, among other tricks. Its approximate price is \$400. For details, circle Reader Service No. 81.



The upcoming revolution in the cassette format is the introduction of metal tape. Metal tape promises the recording enthusiast open-reel quality with the convenience of the small pre-packaged cassette. Be aware that you'll need a new deck to handle this tape. It can't be recorded or erased by your present machine. (It can, however, be played on regular equipment if somebody will do your recording for you.)

The front-loading cassette design has virtually replaced top loaders. If yours is a top loader, anyone can tell at a glance that it's an antique. And the new front-loaders are easier to use than their progenitors. Front doors come off so you can easily get in to clean and demagnetize the heads. And, of course, a front-loader can be stacked with your other equipment rather than sit by itself, record-player style, so that you have enough room to insert the cassette.

Once as rare as hen's teeth, three-head cassette decks are now quite common and some are affordable as well. The advantage of separate record and play heads is well worthwhile to the serious recordist—off-tape monitoring

while recording and better performance overall is nothing to pass over lightly. With separate record and play heads, each can be optimized for its function and that means better response and better dynamic range. Most of the new three-head decks combine the two head sections within the same physical assembly so the azimuth-alignment procedure required by physically separate heads is eliminated.

Many new cassette decks afford much better metering than did their forebears. Peak-responding meters with 40-dB+ range are now available on many models and several firms have introduced ultra-fast responding LED or plasma displays. At least one company (JVC) has introduced multiple indicators—one for each portion of the audible spectrum. With this display you know how the energy is spread over the band and can reduce the recording level should there be more high-frequency energy than the tape can handle.

And AIWA has introduced dual-reading meters—two pointers in the same housing, one indicating the average level, the other peak-responding. In fact, the peak-responding pointer can be operated in a peak-hold mode where it indicates the *maximum* level reached at any time during the program. With these improved metering circuits, your chances of getting a first-rate recording are vastly improved.

For those who want to find out what a cassette can do at higher speed, there is the B.I.C. three-model (on the verge of becoming four-model) series. B.I.C. decks operate at the standard speed and at 3¾ ips as well. Available recording time is halved at 3¾ of course, but high-frequency response and headroom are both improved. Whether or not this

(Continued on page 78)

RECORD PLAYERS ETC.



Mitsubishi offers a deluxe turntable, the DP-EC1, which is fully automatic, logic-controlled, and direct-driven. An optical sensing system is responsible for automatic adjustment of platter speed and for correct sensing of disc size. About \$600. Use Reader Service Number 78.

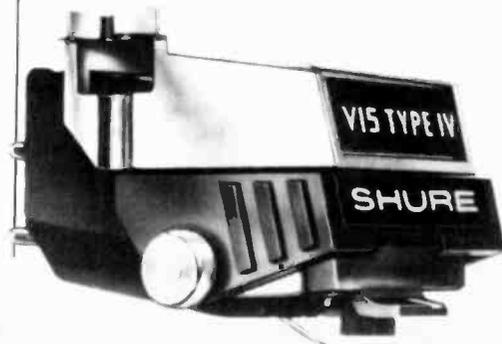
Toshiba's SR-FX70 is a quartz locked, fully automatic, direct-drive turntable which sells for about \$300. 4-digit LEDs to indicate speed, repeat play option, and acoustic insulator feet are all included. R. S. No. 99.



Shure's V15 Type IV phono pickup could improve the performance of your system. A tracking stabilization system helps overcome record warp problems, and a brush for dust and lint removal is also included. About \$150. Circle R. S. No. 93 for details.



Pickering's XV-15/1200E includes a dust removal brush and sells for about \$80. If your current turntable is adequate for your needs, but your current pickup was a throw-in item, a new phono pickup such as this one might boost performance. Circle 95.



AIWA AD-6900U CASSETTE DECK

Circle No. 102 On Reader Service Card



A CASSETTE MACHINE THAT COMPROMISES NOTHING TO GAIN ULTIMATE SOUND QUALITY

□ Just a few short years ago, before the start of runaway inflation and the decline of the dollar, cassette decks were being progressively upgraded to optimize the parameters of the cassette system. In particular, any Dolby cassette deck worthy of the appellation "high fidelity" had some form of adjustment for optimizing the Dolby tracking for a given brand of tape.

As inflation eroded the value of our money, features were often dropped off decks in order to maintain prices in what we consider the budget range. When decks were upgraded, items that were added were often only eye-appeal conveniences which had no effect on sound quality: autoloading; front-rear connections; etc.

It was therefore with much joy that we tested the AIWA AD-6900U, a machine that appears to have compromised nothing on the way to the ultimate in cassette sound quality—a machine that maximizes just about every convenience feature the average stereo-ophile could use.

Heading the list is individual bias adjustment for standard, chrome and Ferrichrome tapes, and a special test oscillator system for accurately making the adjustment. Next, the record level meters have both standard VU and peak-reading characteristics; each meter has two pointers—for VU and peak—so you can simultaneously observe the peak to average (VU) record level ra-

tio. The peak meters also have a *peak-hold* mode, progressively indicating the highest peak record level for a given program selection. The peak reading holds for approximately 30 minutes if desired, allowing the user to carefully preset record levels to avoid overload at any point in a dubbing operation.

The final *higgies* are individual Dolby tracking adjustments for each type of tape, and a calibration system for making the adjustments.

Now all this might sound rather complex, particularly when we speak of calibration and adjustment; but the AIWA deck is a dream, with an exceptional test-calibration system, and adjustment couldn't be easier or faster. Here's how bias and Dolby calibrations are handled.

The front panel has bias and equalization tape selectors for each type of tape; you set these, as you would on any other high performance cassette deck, to match the type of tape being used.

Next, there are three small control knobs, each of which has a screwdriver-adjustment control in the center—coaxially positioned. The knobs adjust the bias level, the screwdriver adjustments are for the Dolby tracking. Finally,

there is a test oscillator switch used for both adjustments. This switch cuts the input signal and applies 400 and 8000 Hz signals to the record circuit. On playback, filters separate the tones, feeding 400 Hz to the left meter and 8000 Hz to the right meter. Since the AD-6900U is a three-head system (simultaneous record-playback) machine, you see the results of the adjustments instantly.

To optimize the machine to a particular brand of type of tape you load the tape, place the test switch in the *on* position, and start the tape drive in the record mode. No other adjustments are needed to get the test system up and running.

The left, or 400 Hz, meter will indicate approximately 0-VU. Simply adjust the bias control until the 8000 Hz meter indicates the 400 Hz level. That's the whole calibration; about five seconds worth of effort. (As we indicate in the test report elsewhere in this issue, even better performance is attained if the 8000 Hz adjustment is set so that the meter reading is about 0.5 dB below that of the 400 Hz reading.)

Now to discuss the Dolby adjustment. Just a few lines back we said the 400 Hz level indicates *approximately* 400 Hz. Using the supplied miniature screwdriver, adjust the coaxial control associated with the bias control so that the 400 Hz (left) meter indicates *precisely* 0-VU. The machine is now precisely adjusted for an almost

(Continued on page 80)



The dual-pointer record-level meters simultaneously indicate the VU and peak signal levels. The peak pointers can also be switched to "hold" a reading after the signal stops, as indicated in this photo. Note the VU pointer is on zero while the peak pointer reads approximately -8 dB.



Meter functions are determined by the switches labeled VU, PEAK, and PEAK HOLD. The memory counter and timer switches directly above the meter switches provide automatic repeat play after rewind, as well as powerline control to play/record from a capstan-disengaged preset.



The Dolby and bias calibration controls are coaxial for each tape type. The screwdriver adjustment in the center of each bias adjustment is the Dolby calibration. The bias adjustment is made along with the bias and equalization switches located just to the right of the bias controls.

DIGITAL SOUND

by HERB FRIEDMAN

One of the difficulties in dealing with new technologies is that many people are myopic, and can't see any farther than the present limits of what they can reach out and touch.

A case in point: Just a few short years ago *crystals*—which are slabs cut from quartz, that vibrate at a specific frequency—were used primarily in transmitters, certain receivers that required precise preset tuning, and transmitter and receiver filters. A substantial portion of all crystals manufactured were used in Citizens Band transceivers. With the advent of the digital frequency synthesizer (such as those which are used for optimal tuning in some of our most expensive high performance FM tuners), the voices of doom and gloom predicted the demise of the crystal industry. And in fact, many crystal companies simply folded.

But a few realized that the same technology that made the crystal unnecessary for many uses, also created new needs for crystals. For example, digital watches use a quartz crystal for the precision frequency reference needed by the integrated circuit that measures, and indicates, time. The "quartz" in the analog (meaning with *hands*) clock or chronograph some of you wear on your wrist is a crystal. The "quartz" in the most modern "quartz-locked" turntables and AM and FM tuners, is a crystal. The frequency reference for your digitally-tuned FM tuner is a crystal ("quartz tuning"). In short, you can hardly turn around these days without stumbling over a crystal. Even your color TV set employs a crystal for the color demodulation.

The very technology that many believed would doom the crystal to obsolescence actually created a booming industry that continuously found new ways for its product to improve other products.

But all this came about because of the few who, like the legendary Windwagon Smith, kept their eyes firmly on the next horizon.

What has all this to do with high fidelity? Simple. Here we are in the midst of the *digital revolution* and all we read about is "better tape recordings through digital recording"; as if the only contribution digital technology can make is to be an intermediary between the performer

A NEW ERA IN HIGH FIDELITY BEGINS

and the listener—an encoder-decoder so to speak.

Sheer nonsense, of course. Another case of *myopia* (near-sightedness). The digital revolution isn't restricted solely to direct recording; rather, it interweaves many technologies, some of which, up to the present time, have had no relationship to the high fidelity industry.

Before going into the varied ramifications of digital technology, let's go over the commonly accepted hi-fi use of digital (digital encode-decode) for those of you not yet familiar with digital recording.

Digital technology is built on a *Base-Two* numerical system, meaning everything is expressed in terms of two conditions—on or off, 0 or 1, go or non-go, zero voltage or some voltage, zero current or some current, etc. It isn't important, for our purposes, what shape the conditions take; all we are concerned about is that there are two *distinct and separate* conditions. The way in which we arrange the utilization of the "bits" that represent the two conditions determines whether we have a *controller*—a device that controls another device exactly as we have instructed it to do, or a *microprocessor* (a small computer)—a device *that can make a decision* based on programmed instructions.

In digital recording we instruct a device to sample the audio signal and convert it to *bits* of digital information. Once in digital form virtually no changes can be unknowingly made to the information (remember, it is go/no-go). If we record the digital representation of the audio signal on tape there can be no distortion generated anywhere in the process after the conversion to digital format, nor can the tape or other recording system generate wow and/or flutter. Finally, on playback, we convert the digital information back to analog format, the signal we hear. If the digital processing is used for the master tape, the tape medium adds neither distortion nor noise before the signal is transferred in analogue form to the pre-recorded tape, or record. Basically, as presently employed, digital recording is used for preparing master tapes for records.

(Just so you don't get carried away dreaming of "noiseless records," the record itself, after the first dust

(Continued on page 52)

DIGITAL SOUND

settles on it, has a signal-to-noise ratio for impulse noise of 65 dB on a good day. As for transmitted signals, the FM station has an inherent signal-to-noise ratio of 60 to 65 dB. And even if you played the record in a dust-free environment, your preamplifier probably has a S/N ratio of 65-70 dB. All in all, the most you can expect is a little less distortion from digital sound processing.)

Now let's move on. In digital recording we are using the technology to control the sound. Now let's look ahead and discuss *computerization*—the use of digital techniques to make a decision.

We are all familiar with the problem of matching bias and equalization to the particular tape being used, particularly when dealing with cassette tape. Imagine the advantages if we could insert any cassette into the recorder and have it automatically tested for proper bias and equalization in just a few seconds, with the recorder automatically establishing the correct bias and equalization for the tape. Sound farfetched? Not so. The latest cassette recorders from a few manufacturers do precisely this, and more. A built-in computer (a preprogrammed microprocessor) controls the tape tests and sets not only the correct bias and equalization, but the correct recording level for optimum Dolby tracking.

Okay, now we are using digital techniques to switch in the correct bias and equalization. Let's go a step farther. You are all familiar with the graphic equalizer, generally used to "tune" a room or electronic equipment to a "flat" or desired sound characteristic. Using large-scale integration for integrated circuits, we can presently put a 1/3-octave graphic equalizer on a couple of chips. (As soon as the chip price comes down we'll see very inexpensive graphic equalizers for the home.) The next step is a microprocessor in a recorder that automatically corrects for every frequency deviation along the entire signal path from microphone input (via pink noise generated by the microprocessor) to the recorder output. Farfetched? Not at all. The same technique is now used for frequency correction in the most modern oscilloscopes.

But why restrict the microprocessor

to recorders? We can build one into an amplifier, with its noise generator, that will automatically correct the *basic* amplifier frequency response to compensate for the speakers' sound characteristics, and the acoustic effects within the listening room or location. It could even correct, or create, psycho-acoustic effects and/or variations.

Carrying the concept of the on-board microprocessor into the realm of personal-preference equalization, consider the many, or few as the case might be, sound sources we use that eventually get some form of equalization. Perhaps it's a recording where we use midband boost to brighten a vocal, or an older disc that needs extra oomph in the low bass for the modern, *beat* sound. Right now we adjust tone controls, parametrics, or graphic-type equalizers *insofar as we are able to remember* the needs of each sound source. But few of us bother to note the equalizer adjustments on a record jacket or tape container. How much easier it would all be if a simple push of a button or two "remembered" the equalization.

Suppose, for instance, that the first time we play a recording we adjust the bass, treble, midband, or whatever equalization we use; and maybe add "dimensional" or "reverberant" effect through the use of a *digital* time delay device. After all your equalization and digital creativity has been satisfied, you press the microprocessor's *memory* button and a digital display indicates a code number, perhaps 123. Next time you play the recording, you just enter the numerals 1, 2, 3 on a keyboard and the amplifier is automatically set for all the effects you originally programmed in on the first listening. Surely a few numbers can easily be entered on record sleeves and tape boxes. (It sure as heck beats writing all the equalization settings and notes.)

Another application for digital techniques to audio relates to the "control track." Virtually every recording medium except home hi-fi recording makes extensive use of a control track. Even the modern studio tape recording generally has a control track for speed regulation, or timing pulses for editing, or whatever purpose the producer might want, including controlling the gain and equalization of mix-down tracks. But in home hi-fi, who knows it exists? Actually, many currently-available turntables use a control track for precise speed control. Printed or etched under or around the rim of the platter is a series of bars providing digital (go/no-go) pulses to an optical or magnetic scanner. The scanner compares the digital signal

from the platter with the digital output of a "quartz reference." If they differ, a correction voltage is sent to the platter drive: in this manner the speed of the platter is maintained constant.

Obviously, the control track concept can be used for hi-fi purposes other than speed regulation, though there are many high-performance cassette recorders that would benefit from a speed regulation control track. Actually, the same tape control track used for speed regulation could be used as a precision tape counter for pre-programmed cueing of particular selections on a tape; and it could be programmed in any order. A control track could be used for splice-free editing, feeding program material from two recorders to a third, with a microprocessor doing the juggling of program selection. They do this in TV studios every day, it might well be convenient for home-use machines, too!

But enough of these mundane run-of-the-mill digital applications for high fidelity; by now you can probably think up another good ten ideas on your own. Let's do the impossible: Resurrect the dead.

Imagine if we could recreate the real sound of long-gone Dixieland groups such as the Dixieland Jass Band and New Orleans Rhythm Kings (DJB and NORK) as it was really played back in the days of Storyville. Well, through digital processing it could be done. We know what instruments were used, their tonal characteristics, and in many instances the original instruments still exist. The total sound can be digitally programmed to respond to what we have—predominantly midband—on the old acoustic recordings. Given the time, money, and or course, a viable market for the end product, we could digitally recreate the sound of the DJB and NORK.

While the technology to recreate new sounds from old recordings still lags behind the dream, there have been practical attempts to recreate Caruso for opera lovers. Both the latter acoustical and early electrical recordings did, in fact, have some response to a relatively wide frequency range. Normally, the ear doesn't hear these sounds, but a computer can sort them out. With much time and effort, the ghost of Caruso *was* partially resurrected. Who knows, with a bigger computer, a lot more time, someone working on his or her Ph.D., and a large government grant, we might get to the point where we'll be buying digitally-restored high fidelity recordings of long-gone greats at our local record shops.

(Continued on page 74)

Opera

For Today

Christa Ludwig

by Speight Jenkins

□ In this magazine's series of portraits of famous opera singers, mezzo sopranos have inadvertently been ignored. Often

Azucena and Amneris, and actually has very much a soprano's range, from around a low A, up to a high C. But the



A mezzo soprano who has both lyric and dramatic roles to her credit, Christa Ludwig possesses a rich natural voice.

the women who cause trouble, who are left behind or who are generally unhappy, the mezzo characters (particularly in the work of Verdi and Wagner), are major indeed. The mezzo-soprano voice comes mainly in two varieties: lyric and dramatic. There are some, incidentally, who argue that lyric mezzos are indeed misplaced sopranos, but evidence, both physical and musical, indicates that this type of singer lacks the sustaining power or brilliance on top to be a soprano. The dramatic mezzo is the one developed by Verdi in such roles as

dramatic mezzo's voice is darkly, richly colored as far up as possible, keeping some darkness on top. The lyric mezzo also has a range from low A up to a high C, but the duski-ness is slighter, almost like a veil. Most can be conveniently fitted into one designation or the other—Ebe Stignani, Fedora Barbieri, Mignon Dunn, Fiorenza Cossotto, and Elena Obraztsova are clearly dramatic, while Dame Janet Baker, Fred-erica von Stade, Teresa Berganza and Rise Stevens are in the other category.

One very great singer

who belongs to the lyric camp but has thrived in both dramatic roles and in more than a few soprano roles is the German artist Christa Ludwig. If Miss Ludwig had never sung a note of opera but only Mahler and Schubert, she would have earned a distinguished place in the annals of song, because she is one of the most distinguished interpreters of lieder in our day. But she would be a lot less famous, for her opera career has been extensive and has built huge audiences both in America and Europe.

She is one of those singers who has a wonderfully rich natural instrument, which she has schooled carefully to express the finest nuance of meaning. Miss Ludwig belongs among the rare gallery of artists who act vocally whenever they are on stage but who can also present a convincing theatrical picture.

This is not to say that she has been without her problems. Because of her enormous success at the Metropolitan Opera in the soprano role of the Dyer's Wife in Strauss' *Die Frau ohne Schatten* in 1966, she was cast all over the world as a soprano. And Herbert von Karajan convinced her that not only could she sing Leonore in Beethoven's *Fidelio* (which she did in only one radiant performance in New York and which is preserved on disc on Angel S-3625) but that she could also sing the three Bruennhildes in Wagner's *Ring*. Her work on the



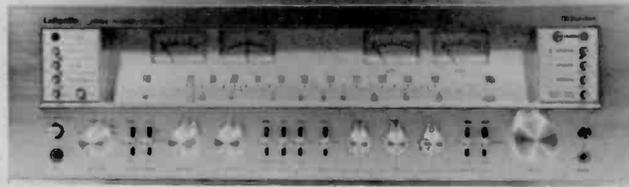
Ms. Ludwig performed a remarkable portrayal of Ortrud, the evil character in Wagner's *Lohengrin*.

first of these she undertook—that of *Siegfried*—precipitated a grave vocal crisis from which she recovered, but which left a mark for some time. It is safe to say now, on the basis of her recent records and a fine recital here in New York last season, that she is vocally healthy again, but she was deprived of some years of her finest singing because of this unfortunate decision to sing dramatic soprano roles.

She first came to New York in 1959 and made little splash as Octavian in *Der Rosenkavalier* and Cherubino in *Le Nozze di Figaro*. In both she was considered too feminine, though there were those of us even then, who were overwhelmed by the velvety quality of her voice and how many emotions she could convey. After the success a few years later in New York with *Die Frau*, she went on to sing a remarkable Ortrud in *Lohengrin* in which she was never shrill, just the embodiment of evil; a Kundry in *Parsifal* (which she will repeat this April)

(Continued on page 76)

LAFAYETTE LR-120 DB RECEIVER



Circle No. 107 On Reader Service Card

A STEREO RECEIVER OF STERLING PERFORMANCE AND MODERATE COST

It wasn't too many years ago that Lafayette Radio—presently known as Lafayette Radio Electronics—was one of the outstanding leaders in budget and moderate priced high fidelity equipment. Their mono, and later stereo, LR-5000 Series of receivers remains among the very best buys in terms of performance and dollar value. In fact, for many equipment reviewers the 5000-series was the standard of reference for budget-to-moderate-priced receivers.

Now, after several years of seemingly disappearing into the woodwork, Lafayette is back with a jam-packed catalog, and a prominently featured

piece of high fidelity equipment is the LR-120Db—a stereo receiver of sterling performance and convenience, once again at moderate cost. If there was anyone left at Lafayette who remembered days of yore, the LR-120Db could easily have carried a 5000 Series designation, for it too assumes a position of leadership in high fidelity performance.

Features Galore. It is difficult to know where to start describing the LR120Db because it is loaded with features, so we'll throw a dart at the catalog . . . and start with the amplifier section.

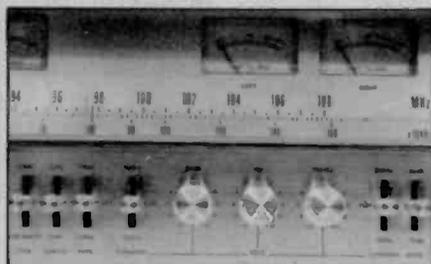
Starting with the amplifier that is FTC-rated for 8 ohms at 120 watts RMS per channel, 20 to 20,000 Hz at a distortion no higher than 0.09% THD, we find bass tone controls with turnover frequencies of 250 or 500 Hz, treble controls with turnover frequencies of 2500 or 5000 Hz, a midband tone control centered on 1000 Hz, dual range treble filters with corner frequencies of 7000 and 12,000 Hz, a choice of a low filter (70 Hz) or a

subharmonic (15 Hz) filter, loudness compensation of both the low and high frequencies or just of the low frequencies, both 15 dB and 30 dB audio mutes, three speaker outputs, and two headphone jacks (for his and her listening?).

(Continued on page 74)



Directly to the right of the FM antenna connections is an FM Input attenuator. It's not generally needed or used, but if an FM station is "down the block" it can prevent an overload of the FM front end section.



Extensive equalization is available with dual range bass and treble controls, a midband tone control, dual range low and high filters, and dual range loudness compensation. Though the output power meters above the tone controls are calibrated at 0.1 to 240 watts, a front panel switch provides a one-to-ten divider for a 0.01- to 2.4-watt power-reading range.



Two somewhat unusual features are a monophonic microphone input with its own level control (you don't adjust the level of other signal sources to match the microphone level), FM mute with a front panel, user threshold level adjustment.

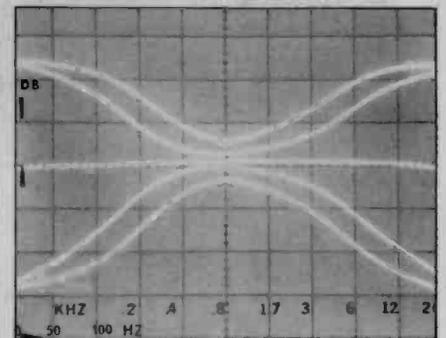


FIG. 1

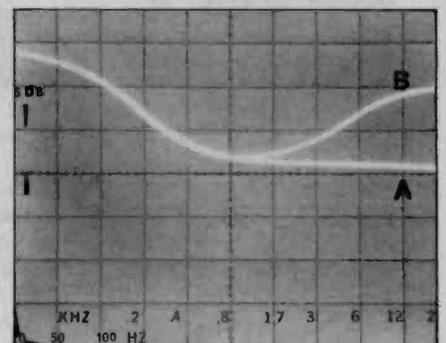


FIG. 2

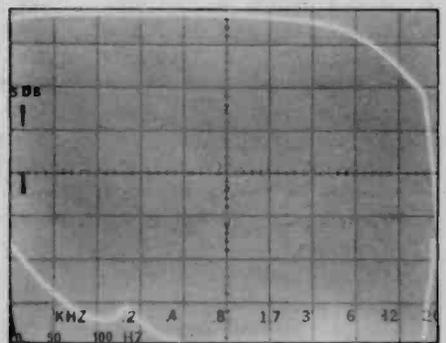
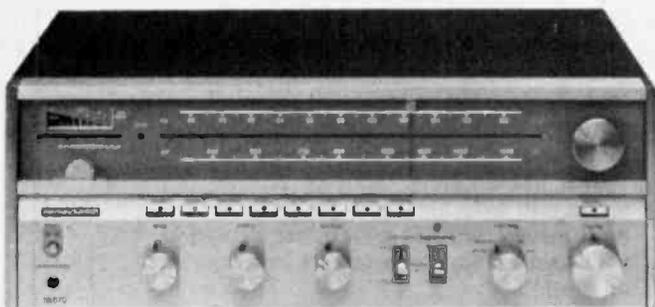


FIG. 3

TEST REPORTS

RECEIVERS / 55	64 / POWER AMPS
TUNERS / 60	65 / CASSETTE DECKS
INTEGRATED AMPS / 61	71 / EQUALIZERS
PREAMPS / 63	72 / RECORD PLAYERS

RECEIVERS



Circle No. 71 On Reader Service Card

HARMAN/KARDON hk-670 AM/FM RECEIVER

This 60-watt-per-channel receiver includes automatic dubbing capability to and from two tape recorders, capability of accommodating two speaker systems, and both switched and unswitched AC outlets. In the lab, it demonstrated solid bass and silky highs more commonly associated with the best of tube amplifiers and also proved to be excellent in terms of its overload characteristics, particularly in the deep bass end of the audio spectrum. \$569.00 in metal cabinet.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 60 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion of less than 0.03% THD. Features include: a stereo beacon; a meter that serves as an FM quieting tuning indicator, an AM signal strength tuning meter, and an FM multipath indicator; an FM in-tune LED indicator; 75 and 25 μ Sec FM de-emphasis; automatic dubbing from/to either of two recorders; a subsonic filter; user-adjustable FM muting level; 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, and input selection. There are switches for power, tape copy selection, tape monitor selection, speaker system A, speaker system B, tone control defeat, subsonic filter, high cut (filter), mono/stereo, 75/25 μ Sec FM de-emphasis, FM muting, and loudness compensation.

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

Overall dimensions are 18½ in. wide x 6¼ in. high x 14 in. deep. Weight is 26 lbs.

PERFORMANCE—FM TUNER: For 300 ohms and "tee" antennas, full limiting was attained with 3.5 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 9 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 70 μ V. Full mute release can be user-adjusted over the range from 6 to 120 μ V.

At standard test level the stereo frequency response with 75 μ Sec de-emphasis measured +0/-1 dB from 20 to 15,000 Hz. With 25 μ Sec de-emphasis, the stereo frequency response was +0.4/-0.5 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.08% to 0.3% THD over the range in which the in-tune indicator was lit, with 0.14% THD at the estimated "center" of this tuning range. The stereo distortion was 0.14% to 0.25% THD over the range at which the in-tune indicator was lit, with 0.12% THD at the estimated center of this range. (There is no clear indicator of center channel tuning.) The signal-to-noise ratio measured 79 dB. Stereo separation was 40+ dB. Selectivity was very good.

PERFORMANCE—AM TUNER: Average.

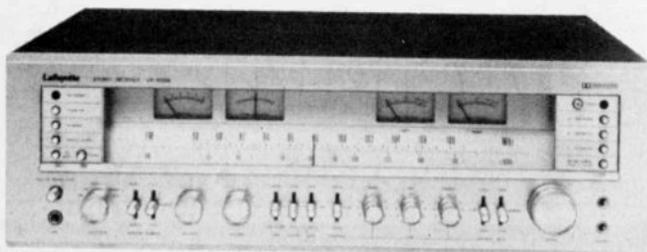
PERFORMANCE—AMPLIFIER: The power output per

channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 61 watts RMS. The frequency response at 61 watts/8 ohms measured +0.7/-0 dB from 20 to 20,000 Hz at a distortion no higher than 0.055% THD at any frequency.

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

The magnetic input hum and noise measured -67 dB; stereo separation was into the noise level.

Note: The overload characteristics are more representative of tubes rather than transistors, and overload is "soft" with excellent recovery. Sound quality has the solid-bass and silky highs generally attained from better tube amplifiers. ▲



Circle No. 107 On Reader Service Card

LAFAYETTE LR-120Db AM/FM RECEIVER

This receiver is capable of notably excellent sound quality and includes extensive tone controls and filters. Among them are ganged bass, midrange, and treble controls with dual-range turnover frequencies for both bass and treble controls; dual range low filter and dual range high filter. A detailed discussion of our lab's findings on this receiver may be found in the *Spotlight On: Lafayette* feature elsewhere in this issue. \$649.99 including a wood cabinet.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 120 watts RMS per channel into 8 ohms, 20 to 20,000 Hz at a distortion no higher than 0.09% THD at any frequency. Features include: a stereo beacon; FM center channel and AM/FM signal strength tuning meters; 75 and 25 μ Sec FM de-emphasis; a front panel FM mute-level sensitivity adjustment; output power meters calibrated from 0.1 to 240 watts (with a 1/10 range provided by a front panel switch); dual range bass turnover frequencies (250, 500 Hz); dual range treble turnover frequencies (2500, 5000 Hz); a midband tone control; dual range low filter (15, 70 Hz); dual range high filter (7000, 12,000 Hz); loudness compensation of low and high end or just low end; monophonic microphone mixing with other signal sources; a three-step sensitivity adjustment for one of two phono inputs; a 15 or 30 dB audio mute; automatic dubbing from/to either of two recorders; a 1:10 FM antenna input attenuator; and an output hold-off to prevent power supply turn-on transients from being fed to the speakers.

In addition to the monophonic microphone input there are stereo inputs for two magnetic phono, aux, and two tape. Outputs for three speaker systems, two tape, and two phones.

Controls are provided for tuning, volume, balance, ganged bass, ganged midband, ganged treble, input selection, microphone mixing level and FM muting level. There are switches for power, speaker system A, speaker system B, speaker system C, output meter range (1/10), Dolby FM (25 μ Sec FM de-emphasis), high blend (mpx filter), mono/stereo, FM muting on, tape dubbing selector, tape monitor selector, loudness compensation or low boost only, low filter cut-off frequency, high filter cut-off frequency, bass turnover frequency/tone control flat, treble turnover frequency/tone control flat, and 15/30 dB audio mute. There are switches on the rear apron for phono #1 input sensitivity and 1:10 FM input attenuator.

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

Overall dimensions are 21 in. wide x 7 in. high x 17 in. deep.

PERFORMANCE—FM TUNER: Full limiting was attained with 12 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 8 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 50 μ V. Full mute release depended on the adjustment of the mute level control, which provided full release from 3.5 to 30 μ V.

At standard test level the stereo frequency response with 75 μ Sec de-emphasis measured +0.1/-1 dB from 30 to 15,000 Hz, down 2 dB at 20 Hz.

With 25 μ Sec de-emphasis, the stereo frequency response measured +0.5/-0.6 dB from 30 to 15,000 Hz, down 1.5 dB at 30 Hz.

Monophonic distortion measured 0.11% THD. Stereo distortion was 0.25% THD. The signal-to-noise ratio measured 73 dB. Stereo separation was 38 dB. Selectivity was very good.

Note: The receiver was in perfect alignment, but tuning is critical and must be precisely set for the meter-indicated center channel in order to attain minimum distortion.

PERFORMANCE—AM TUNER: Essentially average but with slightly higher than average background noise.

PERFORMANCE—AMPLIFIER: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 141 watts RMS. The frequency response at 141 watts/8 ohms measured +0/-0.5 dB from 20 to 20,000 Hz at a distortion no higher than 0.09% THD at any frequency.

The tone control range depends on the setting of the turnover selectors. At 50 Hz, with a 250 Hz turnover, the range measured ± 11 dB; with a 500 Hz turnover, it measured ± 12 dB. At 10,000 Hz, with a 2500 Hz turnover, the range measured ± 9 dB; with a 5000 Hz turnover, it measured ± 6.5 dB. The midband tone control range was ± 6 dB at 1000 Hz.

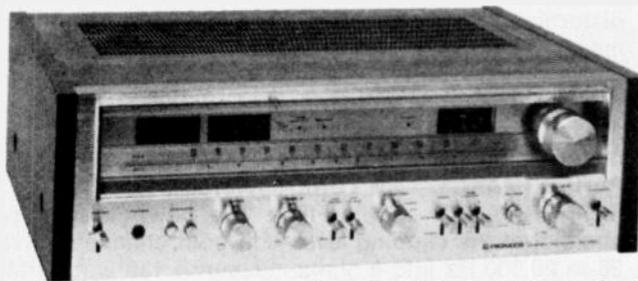
The low filter (15 Hz subharmonic filter) was only 0.4 dB down at 20 Hz. The magnetic input hum and noise measured 65 dB; stereo separation was into the noise level.

The frequency response of the output meters was essentially ruler flat from 20 to 20,000 Hz. The output power calibrations were approximately 20% higher

than true value. It appears they might have some headway so the pointer overswing would more closely approximate *program* average power.

Note: The listening panel reported a notably excellent overall sound quality, and singled out the extensive tone control variations for special mention.

We cannot find a normal condition where the FM antenna input attenuator would be used. We could not synthesize a signal sufficiently strong to overload the FM tuner. Perhaps, if the receiver was used within a few blocks of an unusually powerful transmitter there might be some need for the attenuator, but within 1-mile of a typically strong FM station we did not require the attenuator. ▲



Circle No. 85 On Reader Service Card

PIONEER SX-780 AM/FM RECEIVER

Its rated output is 45 watts per channel, and its features include precisely calibrated output meters, automatic tape dubbing capability from one tape machine to another, and outputs for two different speaker systems. At \$375, it's a respectable high fidelity receiver at a moderate price. Wood cabinet is included.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 45 watts RMS per channel into 8 ohms 20 to 20,000 Hz, with no more than 0.05% THD. Features include: a stereo beacon; combination FM center channel/AM signal strength tuning meter; 75 and 25 μ Sec. FM de-emphasis; left and right output power meters calibrated 0 to 100 watts into 8 ohms and -40 to $+3$ dB, with 0-dB equal to 50 watts; automatic dubbing from one tape to another; and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

There are stereo 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, and input selection. There are switches for power, speaker system A, speaker

system B, loudness compensation, tape monitor #1/dub, tape monitor #2, FM muting, 15 Hz subsonic filter (low filter), high filter, and mono/stereo.

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

Overall dimensions are 18 $\frac{1}{8}$ in wide x 5 $\frac{1}{2}$ in. high x 12 $\frac{1}{2}$ in. deep. Weight is 24.7 lbs.

PERFORMANCE—FM TUNER: Full limiting was attained with 2.9 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 14 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 100 μ V. Full mute release was attained with 6 μ V.

At standard test level the stereo frequency response with 75 μ Sec de-emphasis measured $+0/-0.5$ dB from 30 to 15,000 Hz, down 1.3 dB at 20 Hz. The monophonic distortion was 0.1% THD; the stereo distortion was 0.3% THD. The signal-to-noise ratio measured 68 dB.

With 25 μ Sec de-emphasis the stereo frequency response measured $+0.4/-0.5$ dB from 30 to 15,000 Hz; down 1.5 dB at 20 Hz.

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 43 watts RMS. The frequency response at 43 watts/8 ohms measured $+0/-0.5$ dB from 20 to 20,000 Hz at a distortion no higher than 0.01% THD at any frequency.

The tone control range measured ± 8 dB at 50 Hz; $+7/-6$ dB at 10,000 Hz.

With the subsonic (low) filter switched in, the response was down only 1.5 dB at 20 Hz.

The magnetic input hum and noise measured -72 dB; stereo separation was into the noise level.

The output meter frequency response measured ruler flat from 20 to 20,000 Hz. Power output readings were within 5% of the true value.

This amplifier has an overload cut-out that instantly turns off the output if the output power in the range of 10,000 to 20,000 Hz attempts to exceed approximately 50 watts. ▲

TEST REPORTS RECEIVERS



Circle No. 32 On Reader Service Card

REALISTIC STA-2100 AM/FM RECEIVER

This receiver is conservatively rated at 120 watts per channel with no more than .1% THD. Our lab found that it could exceed that power rating and still stay within its distortion rating. Our listening panel reported notably excellent sound quality, with special mention going to remarkably clean sound in the midrange which is a plus for contemporary music fans. \$600 in wood cabinet.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 120 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at no more than 0.1% THD. Features include: a stereo beacon; FM center channel and AM/FM signal strength tuning meters; 75 and 25 μ Sec FM de-emphasis; output power meters calibrated from 0 to 200 and from 0.1 to 10 watts into 8 ohms; dual range bass turnover frequencies (150, 300 Hz); dual range treble turnover frequencies (3000, 6000 Hz); a midband tone control; a three-step sensitivity adjustment for one of two phono inputs; automatic dubbing from/to either of two recorders; phono jack and wire-terminal speaker connections; 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, and two tape. Outputs for two speaker systems, two tape, and phones. The preamplifier outputs and main amplifier inputs are available on the rear apron.

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

Dolby (25 μ Sec de-emphasis), FM muting, mpx filter, 10 dB attenuator (which also changes output meters to low range), speaker system A, speaker system B, tape dubbing selector, tape monitor selector, bass turnover frequency, and treble turnover frequency. The phono sensitivity switch is on the rear apron.

Overall dimensions are 20½ in. wide x 6⅞ in. high x 16⅞ in. deep.

PERFORMANCE—FM TUNER: Full limiting was attained with 3.4 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 9 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 80 μ V.

At standard test level the stereo frequency response with 75 μ Sec de-emphasis measured +0.2/−1.2 dB from 20 to 15,000 Hz.

With 25 μ Sec de-emphasis, the stereo frequency response measured +0.3/−0.5 dB from 20 to 15,000 Hz.

Monophonic distortion measured 0.08% THD. Stereo distortion was 0.18% THD. The signal-to-noise ratio measured 73 dB. Stereo separation was 40+ dB. Selectivity was very good.

Note: Tuning is not critical. Low distortion values are attained over a relatively broad "center tuning" meter indication.

PERFORMANCE—AM TUNER: Average.

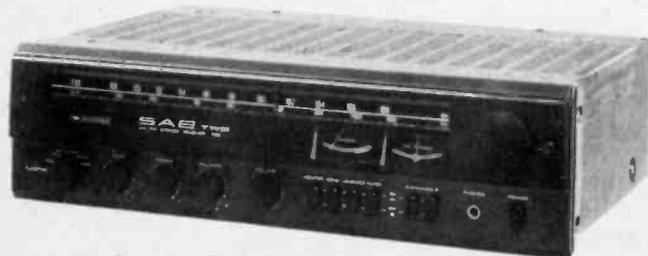
PERFORMANCE—AMPLIFIER: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 135 watts RMS. The frequency response at 135 watts/8 ohms measured +0/−1 dB from 20 to 20,000 Hz at a distortion no higher than 0.12% THD at any frequency.

The tone control range depends on the selected turnover frequencies. At 50 Hz, with a 150 Hz turnover, the range was +10/−11 dB; with a 300 Hz turnover, it was +12/−14 dB. At 10,000 Hz, the range with a 3000 Hz turnover was +9/−11 dB; with a 6000 Hz turnover, it was +5/−6 dB.

The magnetic input hum and noise measured −63 dB; stereo separation was 55 dB.

The frequency response of the output meters was ruler flat from 20 to 20,000 Hz. The output meter calibrations were from 20% to 50% higher than the true value, depending on the position of the pointer. It appears the calibrations have some headway so the pointer overswing would more closely approximate program average power.

Note: The listening panel reported a notably excellent sound quality, with particular reference to an extra midband "oomph" from contemporary music. ▲



Circle No. 88 On Reader Service Card

SAE R3C AM/FM RECEIVER

A nice all-around performer in a moderately priced package. Its power output rating is 30 watts per channel and its features include a low filter and outputs for two speaker systems, one tape machine, and headphones. \$335 in metal cabinet.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 30 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion of no more than 0.09% THD at any frequency. Features include a stereo beacon, FM center channel and AM/FM signal strength tuning meters, and a low filter.

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, and input selection/FM muting. There are switches for power, tape monitor, loudness compensation, low filter, speaker system A, and speaker system B.

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

Overall dimensions are 17.4 in. wide x 5.3 in. high x 14 in. deep.

PERFORMANCE—FM TUNER: For 300 ohm and "tee" antennas, full limiting was attained with 3.2 μ V. The monophonic high fidelity sensitivity was 12 μ V for 59 dB quieting. (We could not perform our standard wide-band test to 60 dB quieting because of a -59 dB hum level.) The high fidelity stereo sensitivity (55 dB quiet-

ing) was 65 μ V. Full mute release was attained with 1.8 μ V.

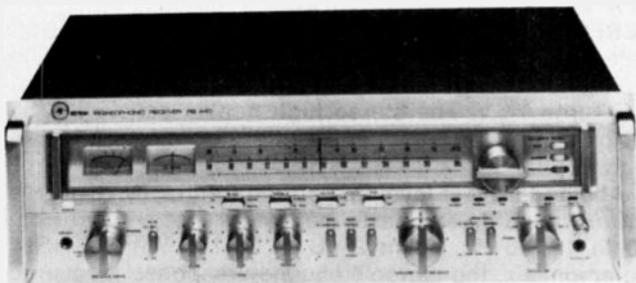
At standard test level, the stereo frequency response measured +0.4/-0.5 dB from 20 to 15,000 Hz. Monophonic distortion measured 0.25% THD. Stereo distortion was 0.38% THD. The signal-to-noise ratio was 61.5 dB. Stereo separation measured 40+ dB. Selectivity was good. Note: Tuning is non-critical and distortion actually is lower either side of center tuning. **PERFORMANCE—AM TUNER:** Background noise is somewhat higher than average at the high end of the dial.

PERFORMANCE—AMPLIFIER: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 32 watts RMS. The frequency response at 32 watts/8 ohms measured +0.4/-0 dB from 20 to 20,000 Hz at a distortion no higher than 0.09% THD at any frequency.

The tone control range measured \pm 11 dB at 50 Hz; \pm 8.5 dB at 10,000 Hz.

With the low filter switched in, the frequency response was down 2 dB at 40 Hz, 5 dB at 20 Hz.

The magnetic input hum and noise measured -74 dB; stereo separation was 55 dB. ▲



Circle No. 91 On Reader Service Card

**SETTON RS-440
AM/FM RECEIVER**

It is able to deliver at least 55 watts per channel with no more than 0.1% THD—and is able to outdo these specs comfortably in our lab tests. Included are bass, midrange, and treble tone controls with dual range turnover frequencies for bass and treble; stereo microphone input can be mixed with other signal sources; and a special protection panel indicates when the amplifier section is being driven beyond the clipping level. \$660. with wood cabinet included.

DESCRIPTION: An AM/FM stereo receiver FTC-rated at 55 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, with no more than 0.1% THD. Features include: a stereo beacon; FM center channel and AM/FM signal strength tuning meters; dual bass (250, 500 Hz) and treble (2500, 5000 Hz) turnover frequencies; a midband tone control; stereo microphone input that can be

mixed with other signal sources; a security panel with lamps indicating excessively high internal temperature, amplifier clipping, and protection (shorted speaker wires); automatic dubbing from one tape to another; two-level magnetic phono input sensitivity; and an amplifier hold-off, that prevents power supply turn-on transients from being fed to the speakers.

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

Controls are provided for tuning, concentric volume/balance, ganged bass, ganged midband, ganged treble, input selection/mpx filter, and power/speaker selection. There are switches for high filter, tone control defeat, mono/stereo, loudness compensation, tape monitor A/dub, tape monitor B/dub, bass turnover frequency, treble turnover frequency, audio muting, and FM muting. A two-level phono sensitivity switch is on the rear apron.

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

Overall dimensions are 21.3 in. wide x 6.7 in. high x 11.8 in. deep. Weight is 30.9 lbs.

PERFORMANCE—FM TUNER: For 300 ohms and "tee" antennas, full limiting was attained with 2.8 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 4.5 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 75 μ V.

At standard test level the stereo frequency response measured +0.8/-1.6 dB from 30 to 15,000 Hz. The monophonic distortion measured 0.11% THD. The stereo distortion was 0.3% THD. The signal-to-noise ratio measured 71 dB. Stereo separation was 40+ dB. Selectivity was very good.

Note: Sharply reduced distortion was attained with the tuning adjusted somewhat off the meter-indicated

TEST REPORTS / TUNERS

center channel.

PERFORMANCE—AM TUNER: Average with considerably less than average background noise.

PERFORMANCE—AMPLIFIER: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 67 watts RMS. The frequency response at 67 watts/8 ohms measured +1/−1.8 dB from 20 to 20,000 Hz. at a distortion no higher than 0.05% THD at any frequency.

The tone control range depends on the selected turnover frequencies. At 50 Hz: with a 250 Hz turnover, the range measured +8.5/−11 dB; with a 500 Hz turn-

over, it measured +9/−13 dB. At 10,000 Hz: with a 2500 Hz turnover, the range was +7.5/−10 dB; with a 5000 Hz turnover, it measured +5/−5.5 dB. The mid-band tone control range was +4.5/−6 dB at 1000 Hz.

The magnetic input hum and noise measured −71 dB; stereo separation was 56 dB.

The protection panel precisely indicated the clipping level from 20 Hz to about midband, and was very slightly low at the extreme highs. As far as program material is concerned, the clipping indicator is precise, and serves as an excellent guard against overdriving the amplifier into distortion. ▲

TUNERS



Circle No. 77 On Reader Service Card

MARANTZ 2110 AM/FM TUNER

This tuner's unusual feature is an oscilloscope display which is built-in, and serves as a tuning and FM multipath indicator and as a mono and stereo audio display which may also be used in conjunction with other audio components. \$340, in leatherette-covered metal cabinet.

DESCRIPTION: An AM/FM stereo tuner featuring a stereo beacon, 75/25 μ Sec FM de-emphasis, an FM mute, and a 1.5-inch oscilloscope that serves as a tuning and FM multipath indicator, and as a mono and stereo audio display. External input terminals and an external input level adjustment allow the oscilloscope to be used as an audio indicator for other mono and stereo components.

One output is provided at line level. There is one line level input for the oscilloscope.

There is a tuning control, and scope controls for vertical position, horizontal position, and external input level. Switches are provided for power, FM, AM, 75/25 μ Sec FM de-emphasis, FM muting, mono/stereo, and oscilloscope switches for display on-off, tuning, audio,

and external input. Screwdriver adjustments for the oscilloscope focus and brightness are on the rear panel.

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

Overall dimensions are 16 $\frac{3}{8}$ in. wide x 5 $\frac{3}{4}$ in. high x 11 $\frac{7}{8}$ in. deep. Weight is 18.7 lbs.

PERFORMANCE—FM TUNER: For 300 ohm and "tee" antennas, full limiting was attained with 3.5 μ V. The monophonic high fidelity sensitivity (60 dB quieting) measured 7 μ V. The stereo high fidelity sensitivity (55 dB quieting) was 58 μ V. Full mute release was attained with 12 μ V.

At standard test level, the stereo frequency response with 75 μ Sec de-emphasis measured +0.1/−1 dB from 30 to 15,000 Hz, down 2 dB at 20 Hz. With 25 μ Sec de-emphasis, the stereo frequency response measured +0.4/−1.1 dB from 30 to 15,000 Hz, down 2 dB at 20 Hz. Monophonic distortion measured 0.22% THD. The stereo distortion was 0.55% THD at the oscilloscope-indicated center channel; 0.3% THD could be attained with the tuning set so that the oscilloscope trace was very slightly to the right of center. The signal-to-noise ratio measured 80 dB. Stereo separation was 40+ dB. Selectivity was very good.

The output level corresponding to 100% modulation of the transmitter was nominally 1.1 volt.

PERFORMANCE—AM TUNER: Sensitivity was much above average. Background noise was slightly higher than average. (Very good performance for those into AM listening.)

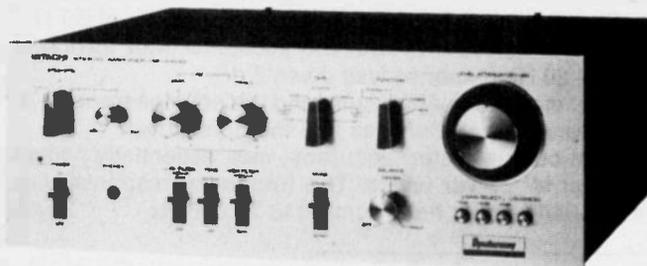
PERFORMANCE—OSCILLOSCOPE: The oscilloscope's stability is very good, and the trace centering made on initial power-up held through the remainder of the tests with no noticeable drift. For FM, the oscilloscope trace indicates relative signal strength, center channel tuning, and multipath. For AM, the trace indicates relative signal strength, and tuning. For both modes it has an audio display, and a stereo display for FM stereo. Connected to external equipment, it provides a "line" display of mono and stereo signals, the same as for

TEST REPORTS/ INTEGRATED AMPLIFIERS

AM and FM. The maximum external sensitivity to provide an edge-to-edge display on the cathode ray tube display (CRT) was 0.14 volts.

The CRT graticle has a central "target" for user set-up of the trace centering (important for proper FM tuning.) ▲

INTEGRATED AMPLIFIERS



Circle No. 72 On Reader Service Card

HITACHI HA-5300 INTEGRATED AMPLIFIER

A 60-watt per channel integrated amplifier with a THD spec of 0.1% which sells for about \$400. Features include two magnetic phono inputs, one of which allows you to select capacitance load (100, 200, 300 pF) via a switch. In our laboratory tests, our distortion measurement was considerably below the manufacturer's spec (we measured .03% THD) which speaks well for Hitachi's spec'ing policies. Its cabinet is metal.

DESCRIPTION: An integrated stereo amplifier FTC-rated at 60 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion no higher than 0.1% THD at any frequency.

Features include two magnetic phono inputs, one of which has switch-selected capacity loading of 100, 200 or 300 pF, three-step loudness compensation provided through gain select attenuators for the volume control, a separate level control for one of two speaker

outputs (speaker system B), automatic dubbing from/to either of two recorders, a low (subsonic) filter, 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, tuner, aux, and two tape. Outputs for two speaker systems, two tape, and phones. The preamplifier outputs and main amplifier inputs are available on the rear apron.

Controls are provided for volume, balance, ganged bass, ganged treble, speaker selection, speaker system B volume level, input selection, and tape dub/monitor selection. There are switches for power, low filter, tone control defeat, high filter, mono/stereo, loudness compensation, and -5, -10 and -20 dB gain select (for volume control). The phono input #1 capacity loading switch is on the rear apron.

One switched and two unswitched AC outlets are provided.

Overall dimensions are 17.1 in. wide x 6.5 in. high x 15.4 in. deep. Weight is 27.1 lbs.

PERFORMANCE: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 66 watts RMS. The frequency response at 66 watts/8 ohms measured +0/-1.5 dB from 20 to 20,000 Hz at a distortion no higher than 0.03% THD at any frequency.

The tone control range measured +10.5/-9 dB at 50 Hz; +9/-10 dB at 10,000 Hz.

The low (subsonic) filter was 2.1 dB down at 20 Hz.

The magnetic input hum and noise measured -70 dB; stereo separation was 49 dB.

The speaker system B volume control is an attenuator that reduces the B output up to 11 dB below the "normal" output. With the speaker system B volume control full on, the speaker B output is equal to the channel A output. ▲



Circle No. 75 On Reader Service Card

KENWOOD KA-5700 INTEGRATED AMPLIFIER

The FTC rates this amp at 40 watts per channel with distortion no higher than .04%. In our tests distortion did not exceed .02% at any frequency. Its features include output power meters, automatic dubbing from one tape machine to another. Its price is \$230, in a metal cabinet.

TEST REPORTS / INTEGRATED AMPLIFIERS

DESCRIPTION: An integrated stereo amplifier FTC-rated at 40 watts RMS per channel into 8 ohms 20 to 20,000 Hz, at a distortion no higher than 0.04% THD. Features include left and right output power meters calibrated from 0 to 60 watts into 8 ohms, automatic dubbing from one tape to another, a subsonic filter, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

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

Controls are provided for volume, balance, ganged bass, ganged treble, input selection, and speaker selection. There are switches for power, loudness compensation, tape dubbing, tape monitor selection, and subsonic filter.

Two switched and an unswitched AC outlet are provided.

Overall dimensions are 15 in. wide x 5½ in. high x 11¼ in. deep. Weight is 16.8 lbs.

PERFORMANCE: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 44 watts RMS. The frequency response at 44 watts/8 ohms was +0/-3 dB from 20 to 18,000 Hz, down 3.6 dB at 20,000 Hz. (Note: The high end response—at 20,000 Hz—can be made "flat" by advancing the ganged treble control two "notches.") Distortion did not exceed 0.02% THD at any frequency.

The tone control range measured ±9.5 dB at 50 Hz; ±8 dB at 10,000 Hz. With the subsonic filter switched in, the 20 Hz response was down 2 dB.

The magnetic input hum and noise measured -75 dB; stereo separation was into the noise level.

The output meter accuracy was essentially within 10% at all power levels. The frequency response was essentially "ruler flat" from 20 to 20,000 Hz. ▲



Circle No. 87 On Reader Service Card

ROTEL RA-2030 INTEGRATED AMPLIFIER

Two magnetic phono inputs are included as features of this 80-watt per channel amplifier. One of these phono inputs allows you to use a switch to select load impedance (35k, 50k, 70k ohms) and also to select capacitance (0, 100, 200 pF). A phono input for a moving coil-type cartridge (with head amplifier) is also included. Peak power output indicators, subsonic and super-sonic filters also included. \$680 in metal cabinet.

DESCRIPTION: An integrated stereo amplifier FTC-rated at 80 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion no higher than 0.01% THD. Features include two magnetic phono inputs, one of which includes switch-selected load impedance (35k, 50k, 70k ohms) and additional capacitance (0, 100, 200 pF) selection; a moving coil (MC) phono input with head amplifier; left and right 13-step LED peak output power indicators calibrated from -18 to +3 dB, with 0-dB representing 80 watts *peak* into 8 ohms; a 1/100 (-20 dB) output indicator divider that makes 0-dB represent 0.8 watts *peak* into 8 ohms; a subsonic filter; a supersonic filter (25 kHz cut-off low-pass type); auto-

matic dubbing from/to either of two recorders; independent selection of amplifier and recorder inputs; 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, one MC phono, tuner, aux, and two tape. Outputs for two speaker systems, two tape and phones. The preamplifier outputs and main amplifier inputs are available on the rear apron.

Controls are provided for volume, balance, ganged bass, ganged treble, input selection, phono selector, recorder input/dub selection, phono #1 input impedance selector, and phono #1 "additional" capacity selector. There are switches for power, tone control defeat, mono/stereo modes, output power indicator on/off/-20 dB, subsonic filter, supersonic filter, loudness compensation, tape monitor 1, tape monitor 2, source monitor, and 15 dB audio muting. The preamplifier-main amplifier separation switch is on the rear apron.

Three switched AC outlets are provided.

Overall dimensions are 19 in. wide x 5.6 in. high x 16 in. deep. Weight is 39 lbs.

PERFORMANCE: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 82 watts RMS. The frequency response at 82 watts/8 ohms measured +0/-1.2 dB from 20 to 20,000 Hz at a distortion no higher than 0.035% at any frequency.

The tone control range measured ±11 dB at 50 Hz; +6/-8 dB at 10,000 Hz.

The subsonic filter has no effect on the response at 20 Hz; that is, it affects only frequencies below that point, which is as it should be. The supersonic filter has 0.5 dB attenuation at 20,000 Hz. (Note: The supersonic filter has no effect on normally heard sound; it doesn't cut background hiss, record scratch, etc. It does however, have some effect on supersonic high frequency noise—like some record scratch impulses—which can drive the amplifier into momentary overload. Accord-

ing to the listening panel the filter either had no apparent effect, or did seem to produce "a better" sound when playing old, scratchy recordings, or when listening to weak-signal FM programming, which is subject to impulse "ignition" noises.)

The magnetic input hum and noise measured -78 dB; stereo separation was 59 dB.

The LED output power indicators appear to be sensitive to voltage peaks, hence, they indicate the peak

program power and serve as a reliable indicator as to the peak power output and the relationship of the output power to the maximum rating of 0-dB (80 watts into 8 ohms). Because there are discrete steps to the LED indicator, there is a non-precise area of sensitivity for power indication. We found the worst-case accuracy to be better than 10%, with an essentially "ruler flat" response from 20 to 20,000 Hz. Overall, the system is an excellent indicator of peak power. ▲



Circle No. 88 On Reader Service Card

SAE C3A INTEGRATED AMPLIFIER

At \$325, this amplifier presents a nice package for a moderately priced system. Power rating is 50 watts per channel, with no more than .05% THD. Among its features are green/red series of LED indicators (green ones indicate power output from 0 to 50 watts, red ones indicate overload from 50 to 100 watts), automatic dubbing to and from either of two tape recorders.

DESCRIPTION: An integrated stereo amplifier FTC-rated at 50 watts RMS per channel into 8 ohms, 20 to 20,000 Hz, at a distortion of no more than 0.05% THD. Features include left and right output power meters calibrated from 0 to 50 watts into 8 ohms (green indicators) and overload indicators in a red area with

100 watt calibration, tone control defeat, low filter, automatic dub from/to either of two recorders, and an output hold-off that prevents power supply turn-on transients from being fed to the speakers.

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

Controls are provided for volume, balance, ganged bass, ganged treble, input selection, and speaker selection. There are switches for power, 20 dB audio muting, loudness compensation, low filter, tone control defeat, mono/stereo, tape dub selection, and tape monitor selection.

Two switched outlets and an unswitched AC outlet are provided.

Overall dimensions are 17.4 in. wide x 5.3 in. high x 14 in. deep. Cabinet is made of metal.

PERFORMANCE—AMPLIFIER: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 55 watts RMS. The frequency response at 55 watts/8 ohms measured "ruler flat" from 20 to 20,000 Hz at a distortion no higher than 0.07% THD at any frequency.

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

With the low filter switched in, the response was down 2 dB at 40 Hz; 5 dB at 20 Hz.

The magnetic input hum and noise measured -65 dB; stereo separation was 54 dB.

PERFORMANCE—METERS: The frequency response of the output meters was essentially "ruler flat" from 20 to 20,000 Hz. The power calibrations were precisely "on the mark" at all calibrations from 0 to 50 watts. ▲

PREAMPLIFIERS



Circle No. 79 On Reader Service Card

DESCRIPTION: A stereo preamplifier which features switch-selected input impedance (22k, 47k, 100k ohms) for two magnetic inputs (one switch for both inputs), a phono #2 level control, dual range low/subsonic filter (40, 20 Hz cut-off), and automatic dubbing from/

NIKKO BETA III PREAMPLIFIER

A preamplifier whose distortion is so low that what we were able to measure could very well just be the residual noise of our measurement equipment. It comes in a metal cabinet with a 19-inch rack panel. It's very small, and thus an excellent choice if you're short on space.

TEST REPORTS/ POWER AMPLIFIERS

to either of two recorders.

There are inputs for two magnetic phono, tuner, aux, and two tape. Outputs for two line level, and two tape.

Controls are provided for volume, balance, ganged bass, ganged treble, input selection, phono #2 level, and phono input impedance. There are switches for power, low/subsonic filter, tape monitor selector, and tape dubbing selection. One unswitched and two switched AC outlets are provided.

Overall dimensions are 19 in. wide x 2½ in. high x 13 in. deep. Weight is 5.9 lbs.

PERFORMANCE: (Note: Unit is rated for 1 volt output and tests were conducted at this level.)

The frequency response measured +0.1/−0.5 dB

from 20 to 20,000 Hz at a distortion no higher than 0.006% THD at any frequency. (The distortion is so low it might actually be residual noise of our measurement instruments.)

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

The subsonic filter was down 3 dB at 20 Hz. The low filter was down 8 dB at 20 Hz.

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

The clipping level of 19 volts output is almost impossible to reach using standard hi-fi equipment, since it requires a high level input of 2 volts, a value beyond the output capacity of virtually all hi-fi equipment. ▲

POWER AMPLIFIERS



Circle No. 91
On Reader Service Card

SETTON BS-5500 POWER AMPLIFIER

This unit consists of two completely independent but identical power amplifiers, one for each channel. No controls or switches are shared. Each section features an output power meter calibrated from .01 to 200 watts into 8 ohms, with 0-dB representing 100 watts. Rated at 120 watts per channel at less than .05% THD, it produced 139 watts per channel, ruler flat from 20 to 20,000 Hz, with distortion no higher than .035% THD at any frequency. Output power metering is also unusually accurate. \$800, in metal cabinet. (May be bought with the PS5500 preamp for a package price of \$1260.)

DESCRIPTION: A stereo power amplifier FTC-rated at 120 watts RMS per channel into 8 ohms 20 to 20,000 Hz, at less than 0.05% THD.

Unit consists of two completely independent, identical

power amplifiers; no controls or switches are shared.

Each section features an output power meter calibrated from 0.01 to 200 watts into 8 ohms and from −40 to +3 dB, with 0-dB representing 100 watts. The line input is bridged (parallel connected with a second phono jack), providing an extra preamplifier connection. There are three speaker outputs per section. A "security panel" has indicators to warn the user of excessive heating inside the amplifier, of signal attempting to exceed the clipping level, and of excessive heating and/or shorted output wiring to the speakers. An output hold-off prevents power supply turn-on transients from being fed to the speakers.

Controls are provided for left level and right level. There are switches for left power, right power, left speaker selection, and right speaker selection.

Overall dimensions are 20 in. wide x 6.5 in. high x 12 in. deep. Weight is 39.6 lbs.

PERFORMANCE: The power output per channel at the clipping level with both channels driven 20 to 20,000 Hz into 8 ohms measured 139 watts RMS. The frequency response at 139 watts/8 ohms measured ruler flat from 20 to 20,000 Hz at a distortion no higher than 0.035% THD at any frequency.

At maximum gain, a 1-volt input produced a 120 watt output. The signal-to-noise ratio referenced to 1-volt in, 10 watts out measured 84 dB.

The frequency response of the output power meters were ruler flat from 20 to 20,000 Hz. Power output indications were either exactly on the mark or within 5% accurate from 0.01 to 120 watts. (Obviously, a 200 watt calibration cannot be checked if the amplifier produces a maximum of 139 watts.)

The security panel worked exactly as claimed. Forced heating of the amplifier (to simulate operational heating) caused the heat lamp to light and the amplifier to shut down. The clipping indicator turned on precisely at the threshold of clipping. The shorted wiring indicator did indicate shorted wiring.

Take note that all indicators turn on when power is first applied, and an indicator showing the speaker

system selected does not turn on until the hold-off delay is released and the amplifier is ready for use. ▲

CASSETTE DECKS



Circle No. 102
Or Reader Service Card

AIWA AD-6900U CASSETTE DECK

A front-loading three-head cassette deck whose high fidelity performance in the lab was simply magnificent. Details on its offerings may be found in the *Spotlight On: AIWA* feature elsewhere in this issue. Our lab's measurements are itemized below. \$850, in metal cabinet.

DESCRIPTION: A front-loading Dolby cassette deck featuring a three-head simultaneous playback system, two-motor drive, solenoid operation permitting full remote control through an optional plug-in remote control unit, microphone/line mixing, selectors for tape equalization and bias for "normal," chrome, and Ferrichrome tapes, a test oscillator system and individual controls for optimizing bias adjustments for all three types of tape, a record level control for each type of tape for optimizing the Dolby tracking, dual pointer left and right record level meters indicating the VU record level and the peak record level (there is a peak hold feature to indicate the absolute peak level of any program), a front panel line input in addition to the usual rear inputs, automatic end-of-tape stop/disengage, a record mute that interrupts the input signal while permitting tape drive, a rear control jack for remote control starting of a record player suitably equipped for synchronized start with the tape deck, timer-control preset switching, and a memory reset counter that provides auto-stop and automatic repeat play after rewind.

There are inputs for microphones and line. Outputs for line, phones, and remote record player synchronization.

Controls are provided for concentric-clutched left and right microphone record level, concentric-clutched left and right line level, ganged output level, normal bias adjustment, chrome tape bias adjustment, and Ferrichrome tape bias adjustment. Each bias adjustment has a screwdriver-adjustment in the center for Dolby tracking calibration using the built-in bias/Dolby test oscillator system.

There are switches for power, tape bias selection, equalization selection, Dolby/Dolby with mpx filter, test oscillator, tape/source monitor, VU meters on, peak meters on, peak meters maximum level hold, timer control selection, and memory counter function.

The tape mechanism has touch controls for the record Interlock, REW, stop, FWD, FF, pause, and record mute. A lever is provided for cassette ejection.

Overall dimensions are 17¾ in. wide x 4¾ in. high x 12⅞ in. deep. Weight is 20.9 lbs.

PERFORMANCE: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured +1.5/-0.4 dB.

Using Maxell UD/XL Type I tape: without Dolby, the record/play frequency response measured +0.1/-1 dB from 30 to 15,000 Hz, down 2.5 dB at 25 Hz. Distortion at the meter-indicated peak, or 0-dB, record level measured 0.08% THD with 8 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 45 dB.

With the Dolby active, the record play frequency response measured +0/-1 dB from 30 to 15,000 Hz, down 2.5 dB at 25 Hz. Distortion and headroom remained the same. The signal-to-noise ratio measured 49 dB wideband, 57 dB narrowband.

Using Maxell UD/XL Type II (chrome) tape: with Dolby, the record/play frequency response measured +0/-0.5 dB from 30 to 15,000 Hz, down 3 dB at 25 Hz. Distortion at the meter-indicated 0-dB record level measured 0.06% THD with 7.5 dB headroom to 3% THD. The signal-to-noise ratio referenced 0-dB record level was 49 dB wideband, 57 dB narrowband.

Using Scotch Master III (Ferrichrome) tape: with Dolby, the record/play frequency response measured +1.5/-0.6 dB from 30 to 15,000 Hz, down 3 dB at 25 Hz. Distortion at the meter-indicated 0-dB record level was 0.07% THD, with 9.5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 47 dB wideband, 58 dB narrowband.

The maximum output level corresponding to a 0-dB record level was nominally 680 mV.

Wow and flutter measured 0.06% steady.

The bias and Dolby calibration controls work exactly

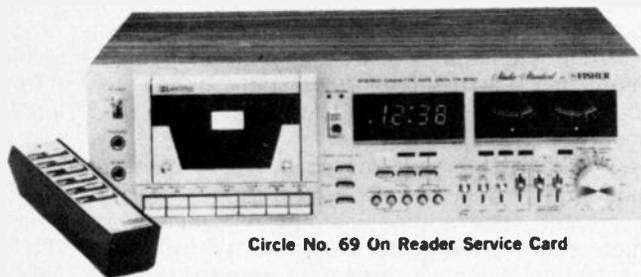
TEST REPORTS / CASSETTE DECKS

as claimed, providing precise bias and Dolby tracking adjustments. However, while the manual specifies the left and right meters should indicate the same when making the bias adjustments, the most precise adjustment is attained when the right meter is adjusted to indicate 0.5 to 1 dB lower than the left meter. (We have seen this effect on other AIWA recorders, it's not uncommon.) The Dolby test system calibrations were precise.

While the signal-to-noise ratio figures appear to be

lower than expected, bear in mind they are referenced to a peak reading that still has at least 7.5 dB headroom; you can essentially add at least 7.5 dB to the noise figures to get a better idea of the quiet background attained from this machine.

Overall sound quality when recordings are made using only peak readings (the way they should be made) are superb. We have not heard better. A dub sounded exactly the same as the record from which it was made. ▲



Circle No. 69 On Reader Service Card

FISHER CR-5150 CASSETTE DECK

A front-loading, three-head, Dolby cassette deck with an outstanding remote control system. Its features include solenoid operation and a digital display which functions as clock, timer, and reset counter. \$700 in wood cabinet.

DESCRIPTION: A front-loading Dolby three-head system (simultaneous record/playback) cassette deck featuring: solenoid operation; full-function wireless remote control; and a digital display (0.5-in. seven-segment bright green) that functions as a clock, timer for clock-controlled record or play, and reset counter in 0.5-second units.

Other features include: selectors for tape bias and equalization; left and right calibrated VU record/playback meters; left and right peak record level indicators; FM Dolby processing; 75/25 μ Sec FM de-emphasis compensation selector for FM tuners not equipped with for 25 μ Sec FM Dolby de-emphasis; left and right FM Dolby calibration adjustments; automatic end-of-tape stop/disengage; a record level limiter; and a reset counter.

The hand-held remote control unit is powered by an alkaline transistor-radio-type 9-volt battery and provides full-function tape control: record interlock, REW, play, FF, stop, and pause. It has an effective range of up to 20 feet.

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

Concentric-clutched controls are provided for left and right record level. There are switches for power, tape/source monitor, tape bias, tape equalization, record

level limiter, Dolby/FM Dolby, mpx filter, timer control (record, play, off), digital display (clock, timer, counter), clock/timer hour set, clock/timer minute set, memory counter on-off, and memory reset. The Dolby compensation switch and FM Dolby calibration controls are on the rear.

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

Overall dimensions are 17 $\frac{3}{4}$ in. wide x 5 $\frac{1}{2}$ in. high x 13 $\frac{1}{8}$ in. deep.

PERFORMANCE: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured +2/-4 dB from 50 to 2500 Hz, down 5.5 dB at 10,000 Hz. Note: Though not in alignment to a standard test tape the recorder is in alignment to itself.

According to the manufacturer the machine was specifically adjusted for BASF tape, so BASF tapes were used for all tests.

Using BASF Professional I tape: without Dolby, the record/play frequency response measured +0.5/-2.5 dB from 40 to 15,000 Hz, down 3 dB at 30 Hz. Distortion at the meter-indicated 0-VU record level was 1.9% THD with 5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 49 dB.

With the Dolby active, the record/play frequency response was +0/-2.6 dB from 40 to 14,000 Hz, down 3.5 dB at 30 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level was 53 dB wideband; 59 dB narrowband.

Using BASF Professional II (chrome bias) tape: with Dolby, the record/play frequency response measured +0/-2.8 dB from 30 to 12,000 Hz. Distortion at the meter indicated 0-VU record level was 1.7% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 52 dB wideband; 59 dB narrowband.

Using BASF Professional III tape (Ferrichrome bias): with Dolby, the record/play frequency response measured +0/-2.5 dB from 50 to 15,000 Hz, down 3 dB at 40 Hz. Distortion at the meter-indicated 0-VU record level was 1.9% THD with 4.5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 51 dB wideband; 59 dB narrowband.

The output level corresponding to a 0-VU record level was nominally 560 mV.

The record level limiter cuts in at -1 dB and is "full in" at 0-VU. It is a "hard limiter," providing instantaneous protection against peak signal overload.

The peak signal overload lamps fade in gradually,

3 to 4 dB above 0-VU record level.

Wow and flutter measured 0.12% with peaks to 0.14%.

The wireless remote control appears to work through infra-red beams, and is operative up to approximately $\pm 45^\circ$ of the front panel receiving sensor. The system is extremely good, providing full remote control of every function, including the record interlock. The solenoid mechanism, which permits the full function remote control, also allows any sequence of operation

without going through stop; for example, the user can use a REW-FF-play sequence, or record-REW-play, etc.

The clock-timer-memory digital display system is the easiest we have yet to see or use. It has an excellent self-explanatory, non-confusing control layout that's so easy a child would have no trouble figuring out how to use it, even without recourse to the manual. A rear apron AC socket controlled by the timer is also provided so that associated equipment, such as a receiver, can be turned on along with the recorder. ▲



Circle No. 107
On Reader Service Card

LAFAYETTE RK-D150 CASSETTE DECK

A good choice for those seeking a bare-bones, budget-priced cassette deck. Its features include Dolby noise reduction, bias and equalization selectors for normal and chrome tapes, and a peak record indicator. \$200, in a metal cabinet with simulated wood-grain finish.

DESCRIPTION: A front-loading Dolby stereo cassette deck featuring individual bias and equalization selectors for "standard" and chrome tapes, calibrated left and right VU record 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.

Concentric-clutched left and right record level con-

trols are provided. There are switches for power, Dolby, equalization, and bias.

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

Overall dimensions are 16.5 in. wide x 5.5 in. high x 13.5 in. deep. Weight is 13.5 lbs.

PERFORMANCE: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured ± 2 dB.

Using Scotch Master I tape: without Dolby, the record/play frequency response measured $+1/-3$ dB from 48 to 13,000 Hz. Distortion at the meter-indicated 0-VU record level was 1.6% THD, with 7 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 50 dB.

With the Dolby active, the record/play frequency response was $+0/-3$ dB from 50 to 8300 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-VU record level was 55 dB wideband; 59 dB narrowband.

Using Scotch Master II tape (for chrome bias): with Dolby, the record/play frequency response measured $+0.5/-3$ dB from 48 to 14,000 Hz. Distortion at the meter-indicated 0-VU record level was 2% THD with 6 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 56 dB wideband; 63 dB narrowband.

The peak record level indicator lamp illuminates when the record level is 6 dB above the meter-indicated 0-VU record level.

The output level corresponding to a 0-VU record level was nominally 580 mV.

Wow and flutter measured 0.1% with peaks to 0.12%. ▲



Circle No. 78
On Reader Service Card

MITSUBISHI M-TO1 CASSETTE DECK

Our lab's first test of the so-called micro components proved that this piece is worthy of being called a high fidelity component. This itty-bitsy tape deck includes peak-reading meters, three-position bias and equalizations selectors, and an automatic spacing pause system. \$560, in a metal cabinet (10 $\frac{3}{8}$ x 5 $\frac{1}{2}$ x 9-11/16 in.).

TEST REPORTS / CASSETTE DECKS

DESCRIPTION: A miniature front-loading Dolby cassette deck featuring a closed loop dual capstan drive, left and right calibrated peak-indicating meters, bias and equalization selectors for "normal," chrome-type, and Ferrichrome tapes, microphone/line mixing, automatic end-of-tape stop/disengage, external timer play and record control, and a memory reset counter which can be set to stop, or automatically play after rewind.

Controls are provided for concentric-clutched left and right microphone level, concentric-clutched left and right line level, and a ganged output level. There are switches for power, counter memory control, Dolby/Dolby with mpx filter, tape bias selection, and tape equalization selection.

The tape mechanism has a feature called ASPS, for Automatic Spacing Pause System. This automatically mutes the input for about 3 seconds followed by application of the pause; it provides a consistent "dead air" spacing between selections. The tape mechanism has touch-buttons for the record interlock, stop, REW, play, pause, and ASPS. The cassette is loaded and ejected by simply inserting or removing it directly onto/from the spindles.

Overall dimensions are 10 $\frac{1}{2}$ in. wide x 5 $\frac{1}{2}$ in. high x 9-11/16-in. deep. Weight is 14 lbs.

PERFORMANCE: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured +2.5/-2 dB.

Using Maxell UD/XL Type I tape: without Dolby, the record/play frequency response measured +0.5/-2.5 dB from 40 to 12,000 Hz; down 0.5 dB at 40 Hz, 3 dB at 35 Hz. Distortion at the meter-indicated 0-dB recording level (which is peak level) measured 1.2%

THD with 5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 50 dB.

With the Dolby active, the record/play frequency response was +0/-3 dB from 35 to 11,000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-dB record level was 55 dB wideband, 66 dB narrowband.

Using TDK-SA tape (chrome bias): with Dolby, the record/play frequency response measured +1.5/-3 dB from 30 to 13,000 Hz. Distortion at the meter-indicated 0-dB record level was 1.1% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 51 dB wideband, 62 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response was +1/-3 dB from 30 to 8000 Hz. Distortion at the meter-indicated 0-dB record level was 1.5% THD with 3 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 52 dB wideband, 62 dB narrowband.

The maximum output level corresponding to a 0-dB record level measured nominally 0.5 volts maximum. Wow and flutter was 0.04% steady; one of the best cassette values we have ever measured.

The peak level meters are excellent; they have a moderate decay, and generally prevent tape overload because the user not only is certain of peak signal values, but also has 4 to 5 dB extra headroom to spare.

The tape mechanism is the new push-in-loading, pull-to-eject type, the easiest to use of all front-loading mechanisms.

(This machine would be a superb performer with better electrical alignment at the factory.) ▲



Circle No. 87 On Reader Service Card

ROTEL RD-2200 CASSETTE DECK

In our lab tests, this machine demonstrated an absolutely superb alignment for normal, bias tape, and exceptionally low wow and flutter. Its features include a 13-segment LED peak indicator panel, bias fine-tuning for normal bias tapes, a record mute, and a headphone level control. \$430 in a metal cabinet with rack-panel front.

DESCRIPTION: A front-loading Dolby cassette deck featuring left and right peak-indicating 13-segment LED "bar light" level indicators calibrated from -21 to +6 dB, bias and equalization selectors for normal, Ferrichrome, and chrome-type tapes, a normal tape bias fine-tuning adjustment (80% to 120%, with a detent at the 100% position), automatic end-of-tape stop/disengage, a memory reset counter, a record mute (that disconnects the signal source when recording as long as the mute switch is held down), and a headphone level control.

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

Controls are provided for concentric-clutched left and right record level, ganged output level, headphone level, and normal bias level. Switches for power, input selection/record mute, Dolby/Dolby with MPX filter, tape equalization, tape bias, LED level display on-off, and counter memory on-off.

The tape mechanism has piano key controls for the record interlock, REW/review, play, FF/cue, pause, and stop/eject.

Overall dimensions are 19 in. wide x 5.9 in. high x 10.2 in. deep. Weight is 19.8 lbs.

PERFORMANCE: The playback frequency response

from a standard test tape with a 50 to 10,000 Hz range measured $+1/-2$ dB.

Note: The *normal* tape tests were made with the bias adjustment at the 100% detented position.

Using Maxell UD/XL I tape: without Dolby, the record/play frequency response measured $+0/-2$ dB from 30 to 15,000 Hz; actually ruler-flat from about 400 Hz to 15,000 Hz. Distortion at the indicated peak record level of 0-dB was 1.8% THD with 2 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 52 dB.

With the Dolby active, the record/play frequency response was essentially the same, except for 14,000 Hz where it was 2 dB down. Distortion and headroom remained the same. The signal-to-noise ratio referenced to 0-dB record level was 59 dB wideband, 62 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured ± 3 dB from 20 to 8000 Hz. Distortion at the 0-dB record level was 2.5% THD. The signal-to-noise ratio referenced to 0-dB record level was 57 dB wideband; 62 dB narrowband.

Using Maxell UD/XL II tape (chrome bias): with Dolby, the record/play frequency response was ± 3 dB from 30

to 5000 Hz. Distortion at 0-dB record level was 2% THD. The signal-to-noise ratio referenced to 0-dB record level was 59 dB wideband; 66 dB narrowband.

The maximum output level corresponding to a 0-dB record level was nominally 1.4 volts.

Wow and flutter was an almost rock-steady 0.06%.

The bar light level indicators have an instantaneous peak rise and moderate decay. They are easy to use and an excellent indicator of peak recording levels. Because the user can push right up against the 0-dB limit without fear that the peaks are going into saturation, extremely clean recordings are the norm for this machine. Further, the effective signal-to-noise ratio is maximized because the user does not have to allow a "protective" headroom against a VU meter reading.

The user bias adjustment for "normal" tapes has no calibration system. If you're not satisfied with the detented 100% adjustment you make a bias correction "by ear." The machine, however, is superbly factory aligned for Maxell UD/XL at 100%. Obviously, Ferrichrome and chrome tapes were not up to high fidelity standards on this machine; though they should not even be considered for use with this machine in light of the "normal" tape performance. ▲



Circle No. 122
On Reader Service Card

SANKYO STD-1850 CASSETTE DECK

A front-loading Dolby deck with bias/equalization selectors for normal, Ferrichrome, and chrome type tapes and a peak record level indicator among its features. It delivers its best performance with normal-bias tape. \$220.

DESCRIPTION: A front-loading Dolby stereo cassette deck featuring selectors for "normal," Ferrichrome, and chrome type tapes, two calibrated VU record meters, a peak record level indicator, automatic end-of-tape stop/disengage, and a reset counter.

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

Controls are provided for concentric left and right record level, and ganged output level. There are switches for power, line/microphone input selection, "normal" tape, Ferrichrome tape, chrome type tape, and Dolby.

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

Overall dimensions are 15 $\frac{3}{4}$ in. wide x 5-15/16 in. high x 9 $\frac{1}{8}$ in. deep. Weight is 14.3 lbs:

PERFORMANCE: The playback frequency response from a standard test tape with a 50 to 10,000 Hz range measured $+1/-0$ dB.

Using Scotch Master I tape: without Dolby, the record/play frequency response measured $+2.5/-1.6$ dB from 30 to 14,000 Hz. Distortion at the meter-indicated 0-VU record level was 1.5% THD with 7 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 49 dB.

With the Dolby active, the record/play frequency response measured $+1.8/-2$ dB from 20 to 13,000 Hz; down 3 dB at 14,000 Hz. Distortion and headroom remained the same. The signal-to-noise ratio measured 52 dB wideband; 60 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured $+4.5$ (at 50 Hz)/ -2.5 dB from 30 to 5000 Hz; down 5 dB at 8000 Hz. Distortion at the meter-indicated 0-VU record level was 1.5% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio measured 52 dB wideband; 62 dB narrowband.

Using Scotch Master II (chrome bias) tape: with Dolby, the record/play frequency response measured $+1.5/-3$ dB from 30 to 8000 Hz; down 5 dB at 10,000

TEST REPORTS / CASSETTE DECKS

Hz. Distortion at the meter-indicated 0-VU record level was 2.2% THD with 3 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-VU record level was 52 dB wideband; 65 dB narrowband.

The maximum output level corresponding to a 0-VU record level was nominally 560 mV. The peak record level indicator turns on when the signal is 3 dB higher than 0-VU; well within the headroom for all tapes. ▲

Wow and flutter measured 0.12% with peaks to 0.15%.

Note: The Dolby frequency response for the Ferrichrome and chrome tapes was not within the limits we require for high fidelity performance. The *normal* tape fidelity, however, is excellent, and good-to-excellent results are attained using even low cost budget-category cassettes. ▲



Circle No. 10 On Reader Service Card

TEAC C-1 CASSETTE DECK

This deck provides plug-in modules which permit you to optimize the performance of the machine with specific high-bias tapes. Alignment is superb for all commonly used tapes. \$1300, in metal cabinet with 19-inch rack panel.

DESCRIPTION: A three-motor, closed loop, dual capstan drive, three-head system (simultaneous record/playback) Dolby cassette deck with prewired connections and switching for an optional dbx noise reduction system. Features include left and right calibrated peak indicating level meters, a front panel pitch control with a $\pm 8\%$ range and a detented *normal* setting, and bias and equalization selectors for *normal*, Ferrichrome, and chrome/option. The "option" designation refers to front panel plug-in modules for chromium dioxide and cobalt-doped high bias tapes. Both modules are supplied factory-adjusted for each family-type of tape, though the controls are user-adjustable for optimization to any specific CrO₂ or Co tape. Other features are a memory rewind counter providing stop or automatic play after rewind, automatic end of tape stop/disengage, prewired sockets for an optional remote control accessory and control lines for a dbx system, a calibration setting for the meters used when adjusting the plug-in modules, a preset switch for timer-controlled record start, and a record mute that disconnects the signal source when recording as long as the mute pushbutton is held down.

There are inputs for microphones and line. Outputs for line and phones. Also, a complete set of dbx accessory connections switched from the front panel.

There are controls for left and right record level

which are friction-clutched to a gear drive—adjusting one control tracks the other, ganged output level, and pitch. Switches are provided for power, timer control, tape-source monitor and meter switching, noise reduction system selection, input selection with or without microphone input attenuator, memory rewind function, tape equalization selection, and tape bias selection. (Adjustments for high bias type tapes are part of the plug-in modules.)

The tape mechanism has touch buttons for the record interlock, REW, play, FF, pause, stop, record muting, and eject.

Overall dimensions are 19 in. wide x 16½ in. high x 137/8 in. deep. Weight is 32 lbs.

PERFORMANCE: The playback frequency response from a standard test tape with a 40 to 12,500 Hz frequency range measured +0.8/-1.7 dB.

Using TDK-AD tape: without Dolby, the record/play frequency response measured +2/-0 dB from 30 to 15,000 Hz; down 3 dB at 20 Hz. Distortion at the meter-indicated 0-dB peak program level was 1.2% THD with 4 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 48 dB.

With the Dolby active, the record/play frequency response measured +1.2/-0 dB from 30 to 15,000 Hz; down 4 dB at 20 Hz. Distortion and headroom remained the same. The signal-to-noise ratio measured 51 dB wideband; 61 dB narrowband.

Using TDK-SA high bias tape: with the Co module and Dolby, the record/play frequency response measured +0.5/-1.6 dB from 30 to 14,000 Hz; down 2.5 dB at 25 and 15,000 Hz. Distortion at the meter-indicated 0-dB peak program level measured 2.5% THD with 1.5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 54 dB wideband, 64 dB narrowband.

Using Sony Ferrichrome tape: with Dolby, the record/play frequency response measured +1.5/-3 dB from 22 to 12,000 Hz. Distortion at the meter-indicated 0-dB peak program level was 1.4% THD with 4.5 dB headroom to 3% THD. The signal-to-noise ratio referenced to 0-dB record level was 52 dB wideband, 64 dB narrowband.

The maximum output level corresponding to a 0-dB record level was nominally 1 volt.

Wow and flutter was a "rock steady" 0.06%.

The peak level meters are superb: they have a very fast attack and a slow decay—almost a temporary *hold*, and generally prevent tape overload because the user gets an excellent idea of actual peak program levels.

The pitch control provided a measured range of

+11/-9%. There is a very slight, essentially insignificant speed variation from mode to mode. For example, there was a 0.36% speed variation between normal speed with the pitch control (in the detented normal position) pushed in (out of circuit), and normal with the pitch control pulled out (in circuit). The pitch

control affects only playback; the recording is made at normal speed regardless of the control's adjustment.

While user calibration of the plug-in modules to a specific high bias tape is relatively easy, it does require an external audio signal generator (there is no built-in test system). ▲

EQUALIZERS



Circle No. 85 On Reader Service Card

NIKKO EQ-1 GRAPHIC EQUALIZER

A graphic equalizer with ten equalizer controls per channel, spaced one octave apart. In the lab, it exhibited notably low distortion, even at full boost. It can easily be switched to provide pre-equalization and/or post-equalization when making tape recordings—herein lies its major advantage. \$280, in rack-mount metal cabinet.

DESCRIPTION: A graphic-type stereo equalizer with ten equalizers per channel spaced one octave apart on center frequencies of 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16,000 Hz. Each equalizer control has a rated range of ± 12 dB at the center frequency.

Unit has unity gain with line level inputs and outputs. (A selector provides for ± 6 dB output variation.) It normally connects to an amplifier's or receiver's tape jacks, with the recorder connections moved to the equalizer. Equalization can be switched from the signal source to

either the tape input or output.

Each channel has ten equalizer controls. There are switches for power, equalizer in/out, -6/0/+6 dB output level, and source/pre-tape/post-tape equalization. One unswitched AC outlet is provided on the rear apron.

Overall dimensions are 19 $\frac{1}{2}$ in. wide x 3 $\frac{3}{8}$ in. high x 9 $\frac{1}{2}$ in. deep. Weight is 11 lbs.

PERFORMANCE: (Note: This unit is rated for a 1 volt output, 7 volts maximum. Tests were conducted at 1 volt input.)

With the equalizer controls set to their detented center position (off), the frequency response was "ruler flat" from 20 to 20,000 Hz at a distortion no higher than 0.007% THD at any frequency. With the equalizers set for maximum boost—with 1 volt input—the maximum distortion at any center frequency was 0.02% THD (at 16,000 Hz). (Distortion was lower at lesser levels of boost.) The equalizer range measured nominally ± 12 dB.

No clipping was discernable up to 12 volts output with full boost applied and up to 3 volts input (the limits of the test equipment), a value well above normal hi-fi equipment levels.

The signal-to-noise ratio referenced to 1 volt input was 75 dB.

The gain switch provided exactly ± 6 dB output level variation with no measureable effect on any other parameters.

A major advantage of this equalizer is that it can be easily switched for pre- or post-equalization of a tape recording. ▲



Circle No. 129 On Reader Service Card

DESCRIPTION: A graphic-type stereo equalizer with ten equalizers per channel spaced one octave apart with center frequencies at 30, 60, 120, 240, 480, 960, 1920, 3840, 7680 and 15,360 Hz. Each equalizer control has a rated range of ± 15 dB at the center frequency.

SPECTRO ACOUSTICS 2102 GRAPHIC EQUALIZER

A graphic equalizer with a rated boost/cut capability of 15 dB at ten intervals, one octave apart. It measures up to the performance standards set by our lab for its type and price range. \$200 in metal cabinet. Adaptable for rack mounting.

TEST REPORTS / RECORD PLAYERS

Unit has unity gain, with line level inputs and outputs. It normally connects to an amplifier's or receiver's tape recorder jacks, with the tape recorder connections moved to the equalizer.

Each channel has ten equalizer controls. A single switch provides for equalizer in/out/tape monitor. There is no power switch; power is controlled by the associated equipment. One unswitched AC outlet is provided on the rear apron.

Overall dimensions are 17 in. wide x 3.5 in. high x 8.25 in. deep. (Rack mounting accessory "ears" provide standard 19-in. rack width.) Weight is 9 lbs.

PERFORMANCE: (Note: This unit is rated for a 1 volt input, and an output level clipping threshold of 10 volts. Tests were conducted at 1 volt input.)

With the equalizer controls in their detented center position (*off*), the frequency response was "ruler flat" from 20 to 20,000 Hz at a distortion no higher than 0.007% THD at any frequency. With the equalizers set for maximum boost—with 1 volt input—the maximum distortion at any center frequency was 0.41% THD (at 30 Hz), decreasing to 0.18% THD at 15,380 Hz. (Distortion was even lower at lesser values of boost.) The equalizer range measured nominally ± 12 dB.

The clipping level was 11 volts. With full boost applied clipping did not occur until the input voltage reached 2.5 volts, a value well above normal hi-fi equipment levels.

The signal-to-noise ratio referenced to a 1 volt input measured 73 dB. ▲

RECORD PLAYERS



Circle No. 75
On Reader Service Card

KENWOOD KD-5070 AUTOMATIC RECORD PLAYER

A two-speed fully automatic turntable whose resistance to external shock and vibration is considerably higher than average. Among its features is the ability to repeat-play records. Also of interest is automatic indexing for standard-sized records. Tonearm lifts automatically at the end of a side and recycles back to the tonearm rest in the event that repeat play is not desired. Our listening panel reports that high quality pickups deliver ever better sound quality when used in this particular turntable. \$285, including an integral base and a dust cover.

DESCRIPTION: A two-speed (33, 45 rpm), electronically-controlled, fully automatic record player for single rec-

ords (no multi-record play) with full-time illuminated 33 and 45 rpm strobes and individual 33 and 45 pitch adjustments. Control lever provides automatic indexing for 12-, 10- and 7-inch records, or manual start. In both automatic and manual start modes, the tonearm recycles to the rest and power is turned off at the end of play. Alternatively, a record can be endlessly repeated as long as it is one of the three standard sizes.

There are controls for 33 speed, 45 speed, 33 pitch, 45 pitch, manual start/auto (with tonearm indexing for 12-, 10- and 7-inch records), repeat play lock, play (start)/cut (reject), and tonearm lift.

The tonearm lift always keeps the pickup at the end of the cycle even if the lift control is accidentally set to *down*. The mode must be set specifically for manual before the tonearm can be manually placed on the record.

The tonearm has a micro-adjust counterweight that also serves as a 0 to 3 gram vertical tracking force (VTF) adjustment calibrated in 0.1-gram increments. There is a calibrated anti-skate. The pickup mounts in a universal carrier for which a stylus overhang gauge is provided. A locking tonearm rest is provided. The output cable capacity is nominally 90 pF.

PERFORMANCE: Speeds remained constant with essentially total immunity to transient line voltage variations over an applied test range of 90 to 140 volts. The 33 pitch control range measured $+5.4/-7\%$ at 33 rpm; $+3/-5\%$ at 45 rpm. Wow and flutter measured 0.05% with peaks to 0.12%.

The tonearm's stylus force adjustment was "on the mark" throughout the entire range. Resistance to external shock and vibration was considerably higher than average, and is therefore, especially recommended to those who have shaky floors. The automatic tonearm lift at the end of play is an especially good feature if the player is to be handled by children.

The listening panel reported that better quality pickups appeared to deliver "a little bit extra" in the way of sound quality when used in this record player. ▲

A GUIDE TO RECENT STEREO RECORDINGS

by THOMAS D. KELLY

An avid record collector for nearly 20 years, Thomas D. Kelly has a keen ear for both live music and full-fi sound. Mr. Kelly played the records he reviews here on equipment consisting of an Empire 39 transcription system with a Shure V15 III cartridge, a C/M Labs 911 stereo amplifier, a Marantz 7T pre-amp, and two Bozak B-400 speakers.

© Bach: *Concerto in A Minor, BWV 1056; Concerto in E Minor from BWV 1059 and 35; Suite No. 2 in B Minor.* James Galway, flute; I Solisti di Zagreb, RCA Victor ARL1-2907.

These two concertos were originally written for other instruments, but as was the custom of the time, have been transcribed for a variety of instruments. They sound just fine on the flute, particularly when played as beautifully as they are here. Galway, who has had the distinction of playing principal flute with the Berlin Philharmonic, the London Symphony and the Royal Philharmonic, recently set out on what has developed into an auspicious solo career. If you haven't heard his display recordings—"The Magic Flute of James Galway" and "The Man With the Golden Flute" (RCA LRL1-5131 and LRL1-5094), they are well worth investigating, as is his recording of the Mozart concertos for which he received a Grand Prix du Disque (RCA ARL1-2159).

© Holst: *Suite No. 1 in E Flat, Suite No. 2 in F*; © Handel: *Music for the Royal Fireworks*; © Bach: *Fantasia in G.* Cleveland Symphonic Winds, cond. Frederick Fennell, Telarc 5038.

Probably most sound buffs will want to have this recording, as it offers some quite astoundingly realistic bass reproduction. The bass drum in the Holst suite is remarkable, and this is the first time I have really believed a jacket warning to the effect that the sounds could actually damage a speaker system. One might wish for a crisper sound for the woodwinds, but the overall effect is very natural, clear and clean . . . and that bass drum is guaranteed to bring down the house, if your equipment is capable of handling

it. The musical values here are equally high. Fennell is an old hand at this sort of repertory, and the performers are mostly members of the Cleveland Orchestra. This is a digital recording, and the album includes a detailed explanation of the process. The producers feel this method is superior to the direct-to-disc process as it is possible to get more music per side, and editing can be done. This LP offers about 20 minutes per side, well more than most direct-to-disc recordings. Even with the reasonable playing time, you will pay dearly for your demonstration sound: the list price on this LP is \$14.95!

© Krommer: *Octet-Partita in F, Op. 57; Octet-Partita in E Flat, Op. 69; Octet-Partita in E Flat, Op. 79.* Netherlands Wind Ensemble, Philips 9500 437.

Franz Krommer (also known as Franz Vinzenz) lived from 1760 to 1831, and was highly popular during his time for his innovative scoring for wind instruments. This superb new Philips LP offers three of the thirteen *harmonien* composed by Krommer at the beginning of the 19th century.



Wind music at its best

Each of the three contains four contrasting movements, and all are a delectable treat to the ear when played as expertly as they are here. The rich sounds of the Netherlands Wind Ensemble, comprised of members of Holland's leading orchestras, are stunningly captured by the Philips engineers, and this LP can be highly recommended on all counts.

© Mahler: *Symphony No. 1 in D, "Titan."* London Philharmonic Orch., cond. Klaus Tennstedt, Angel S 37508.

Tennstedt has been widely acclaimed for his guest conducting appearances with major American orchestras, and rightfully so, judging by the live radio broadcasts I've heard. He recently was

appointed music director of the London Philharmonic, signing a five-year contract, and on this new disc presents his first recording with them. Unfortunately his debut is not an auspicious one. There is little of Tennstedt's originality and conviction to be heard here. This is a Mahler 1 of considerable haste, distinguished by some caressing phrasing, but lacking the cataclysmic power of many competing versions. The orchestral playing is adequate but little more, and the engineering decidedly disappointing, with a blurred bass and little impact. This is the first issue in a projected Mahler cycle to be recorded by Angel with the same orchestra and conductor over the next few years. I hope future releases in the series will be superior to this.

© Mahler: *Symphony No. 6 in A Minor, "Tragic."* Berlin Philharmonic Orch., cond. Herbert von Karajan, Deutsche Grammophon 2707 106, two records.

The "Tragic" is perhaps the most personal of all of the Mahler symphonies, and well named. It is an epic, massive work, intensely soaring, ending with quiet resignation. The Solti-Chicago Symphony London album is a virtuoso accomplishment, stunningly well recorded, and up to this time has been my favorite recording of this remarkable symphony. But the new Karajan is superior. One would think it not possible for the score to be played with more sensitivity than that displayed by Solti, but this remarkable feat is accomplished by Karajan, particularly in the exquisite *Andante* which so often is only a relatively reposeful interlude between the anguished agitation of the other three movements. This is a heaven-storming interpretation of the greatest mastery, the epitome of orchestral perfection, and a performance captured with stunning, broad realism by the DG engineers. Unquestionably, this is one of the great Mahler record-



Surpasses Solti recording

STEREO RECORDINGS

ings of all time. It is surprising that Karajan has come to Mahler so late in his career. Thus far he has recorded only the "Symphony No. 5," "Das Lied von der Erde" and some *lieder*. I look forward to more recordings in the near future.

© Prokofiev: *Piano Concerto No. 3 in C, Op. 26*; © Ravel: *Piano Concerto in G*; © Copland: *Appalachian Spring Ballet Suite, El Salon Mexico Rodeo Ballet Suite*. Dallas Symphony Orch., cond. Eduardo Mata, RCA Victor ARL1-2910 and ARL1-2862.

Eduardo Mata is surely one of the finest young conductors on the scene today, and already has to his credit superb recordings of music by Falla and Revueltas, recorded with English orchestras. These are his first two recordings with his own orchestra and

while intentions are good, the fact remains that the Dallas Symphony is not among America's finest orchestras. Their playing here is often tentative with weak violins, and their cause is not helped by a quality of reproduction that lacks resonance, robbing the strings of whatever warmth they might have had. Soloist Tedd Joselson, who is a specialist in Prokofiev and already has recorded the "Concerto No. 2" plus several sonatas, plays the two concertos vigorously, but with accompaniment and reproduction such as he receives here, he doesn't have a chance. ▲

DIGITAL SOUND

(Continued from page 52)

By now you should have the idea that *digital* can mean a lot more than simply a new way to record sound, or even amplify sound. In terms of the BIG PICTURE, like they say in the war movies, digital sound isn't even a skirmish. Does it really make any difference whether digital processing can reduce an amplifier's distortion from 0.01% THD to 0.005% THD?

In the area of sound recording: Sure, digital mastering presently delivers astounding S/N ratios, and exceptionally low distortion (only that of the A/D and D/A converters—Analog, Digital—and the analog amplifiers), but with metal particle tape finally a reality, will there be a significant value to the digital recording technique? In this author's opinion the answer is no. Digital mastering is simply a weigh station on the way to the latest analog recording tape technology.

If you want to consider some more radical possibilities for using true digital sound, try this on for size. Imagine hearing a new recording on the radio, and immediately being able to get a recording fed down the phone line from a "record library" by simply

touch-tone dialing a phone number and some appropriate identification. At the end of the month your phone bill will contain a charge for the recording feed—at a lower cost than purchasing the record or tape, naturally.

Yes, yes, we know that current phone line sound quality is merely voice grade and couldn't contain enough digital information to duplicate early acoustic recordings. But begin to think in terms of fiber optics technology then you begin to see other possibilities.

Fiber optics technology offers a way to transmit light from one point to another, and a practical fiber optic "home" telephone circuit has already been demonstrated. Fiber optics have a virtually unlimited frequency response and are almost loss-free and noise-immune. Through present multiplex techniques, a means whereby several different signal sources can be transmitted simultaneously through the same circuit with no interference between the sources, it is possible to accommodate a telephone call, unlimited TV channels, music channels, and transmitted reading materials (such as Viewtext) on a single sub-

scription to a fiber optic telephone circuit. Maybe not today, but in our lifetime, we will use *digital encoding* to obtain a *digitally transmitted or multiplexed* recording from a "library."

Summing Up. How fast we derive the special high fidelity benefits from digital techniques depends on how quickly we look beyond the fashionable fad of digital sound to the more far-reaching possibilities of digital control and the microprocessor. Today, digital control has given us devices which virtually eliminate record "crackles," as well as digital delay devices, while the microprocessor has given us automatic adjustment of a recorder's bias, equalization, and Dolby tracking level.

If we again bog down in a limited application of digital technology with little real value for most people, will there be enough trust left among stereophiles to support further experiments with future technological breakthroughs?

It is more important to focus our attention on broadening our use of digital techniques to enhance and expand the excellent technological base we have already. ▲

SPOTLIGHT ON: LAFAYETTE LR-120DB

(Continued from page 54)

Before moving on, let's take time out for a closer look at the assorted tone controls and loudness compensation. In all illustrations the horizontal sweep is 20 to 20,000 Hz, with each major vertical division representing 5 dB; each minor division is 1 dB.

Figure 1 shows the maximum tone control characteristics using all four bass and treble turnover frequencies. For clarity, the midband tone control is not shown. In particular, note the top bass boost curve, a modified "shelf" equalizer that permits the entire bass range to be equalized evenly, a desired characteristic when using large speakers that have a normally wide, and full bass response.

The straight line across the middle of the screen is the almost "ruler flat" response obtained with the one control turnover controls set to the "flat" response position.

Figure 2 shows the maximum effect of the low-boost and "normal" loudness compensation features. Note that both traces overlap at the bass frequencies. The low-boost curve (A), however, is essentially flat from about 700 Hz to 20,000 Hz. The "normal" loudness compensation curve (B) provides a rising treble characteristic to compensate for normal insensitivity of the ear to higher (and lower) frequencies at low volume levels.

Moving along we get to the FM

tuner section, which has a front panel selector for 25 μ Sec. de-emphasis, the value required for FM Dolby stations. The received frequency response for 25 μ Sec. de-emphasis is shown in Fig. 3. What's important here is not the curve, which is almost perfect, but the lower trace that represents stereo separation. (We used 25 μ Sec. because it gives a worse case than the standard 75 μ Sec. setting would). First, note the midband separation is right off the bottom of the screen at 38 dB. More important, it is off the screen between 400 Hz and 15,000 Hz. The worst-case separation is 28 dB at 20 Hz. This is one *heck* of a separation curve, which would be impossible to attain

without darn good *overall design and alignment*. The quality is reflected in a very "sweet" FM sound, far superior to what might be implied by the measurements given in the test report elsewhere in this issue. (Perhaps distortion below a certain value is meaningless. Perhaps super-low distortion val-

ues really don't indicate the "quality" of FM sound. Whatever, the FM sound quality in the LR-120Db is exceptionally good.)

Summing Up. It's obvious we are impressed by the Lafayette LR-120-Db, particularly in view of its catalog price of \$649.99. Additional informa-

tion and performance is detailed in the test report elsewhere in this issue. Who knows, perhaps the Lafayette LR-120Db will become another "family type" like Lafayette's well-remembered and respected 5000 Series.

For additional information circle No. 107 on the Reader Service Card. ▲

CASSETTE DECK FEATURES

(Continued from page 37)

Another new type of metering comes from Sony. In its Models TC-K8B and TC-K60 it uses two liquid crystal, peak-reading record level meters for high accuracy in record level setting and maximum protection against overload distortion. Each one uses 64 separate liquid crystal elements that respond instantly to the subtlest transient signal peaks over a range from minus 40 to plus 5 dB. They also have a manual and automatic peak-holding capability which enables the meters to memorize and display the highest peak value contained in any given program.

User-Adjustable Bias. In the past few years cassette equipment manufacturers have been designing decks with two or three-position bias and equalization switches to accommodate various tape types to assure first-rate recordings. A recent development on this front is "fine-tune" biasing, as achieved in AIWA's Model AD-6900U under the designation of FRTS for Flat Response Tuning System. Incorporating high and low frequency oscillators, it enables variation of the bias signal. The result is immediately displayed on the VU meters, and all that you need do is turn the proper bias fine adjuster knob until left and right meters display the same levels. This indicates setting to optimum bias to achieve the flattest frequency response and most faithful reproduction of the source. AIWA's Model AD-6350U has independent 3-step bias and equalization selectors with a bias fine adjuster for LH tapes.

Kenwood also offers fine tuning of bias in its three-head Model KX-1030 at \$450.00. Fine tuning complements the unit's 9-way bias/equalization system (3-position bias, 3-position equalization controls) and permits perfect adjustment to the exact bias required for the frequency characteristics of the tape in use. Technics in its Model RS-M44 at \$400.00 offers fine tuning of bias in three tape positions, and in its Model RS-M95 at \$1300 offers fine tuning of bias in four tape positions—three traditional, plus one to accommodate fine metal particle tapes coming on the scene. Onkyo calls its system of fine bias adjustment "Accu-BIAS." It appears in that firm's Model TA-630D at about \$350. Hitachi offers adjustable bias in its new D-580 at

about \$380. Pioneer does so in its Models CT-F500 at \$195, and CT-F700 at \$400. It is also available in the Mitsubishi DT-30 at \$650.

Automatic Biasing. Another development along these lines is *automatic biasing*, plus automatic equalization, as achieved in Hitachi's new "computerized" Model D-5500 at \$1000. Slip a cassette into it, wait a few seconds, and *presto!* bias and equalization are optimized. This feature is also available in Onkyo's TA680D (including a fine metal tape setting) at "over \$700", and JVC's KD-A8 at \$750. Expect to see this valuable "plus" in other new machines appearing at your local hi-fi outlet. For the moment it will be confined to higher priced models, but in a year or so will appear at a smaller premium.

Monitoring Capability. One mark of the serious recordist is his involvement in the recording process via the monitoring switch. In some hi-fi systems what you hear in the so-called "moni-

tor" position is the signal that's going into the recording head, and it's merely a check that a signal is present. On more sophisticated true three-head machines you'll find a separate playback head, enabling you to hear the signal immediately after it has been recorded, giving you a true idea of the characteristics of a recording in the making—and permitting you to make adjustments accurately, if needed. In some cassette decks the record and playback heads, while separate, are contained in the same casing. In the more expensive models these heads are entirely separate. In the latter case you have a slight edge in optimizing the recording process in terms of maximum output and highest frequency response, in that some of the units provide an azimuth adjustment. Which type of three-head system you select will depend on how critical you are. You'll find three-head machines in at least 20 nationally-advertised brands, with prices starting at about \$300 for a model from Fisher,

ON OUR COVER

Featured on our cover this issue is the Hitachi D-5500 cassette deck. Among its many features is an automatic performance optimizing feature which is microprocessor-controlled. Bias, equalization, and recording level are automatically optimized by this feature. Another feature is its full function remote control which operates as the function con-

trol panel during non-remote use, but is removable when the user wants to use it as a wireless remote control. The D-5500 is a three-head cassette deck, with record and play heads in a single housing. At press-time, the Hitachi D-5500 is expected to sell for about \$1200. Circle Reader Service Number 72 for detailed information on this unusual unit.

LOS ANGELES HI FI STEREO MUSIC SHOW

SHERATON UNIVERSAL · MARCH 15, 16, 17 & 18

Public Hours: Thurs. & Fri. 5-10 PM; Sat. 11 AM-10 PM; Sun. Noon-7 PM.

and running as high as over \$1,600 in the Technics and Nakamichi brands.

Automatic Reverse. One of the most valuable features previously common to reel tape recorders is gaining popularity in cassette decks. It is automatic tape reversing. When a tape comes to its end, the machine is "triggered" into reversing its direction, and continues to the end of the second side of the tape. While a few cassette machines have had this feature, it has been offered largely only in the playback mode. Now you'll find an increasing number of new decks offering auto-reverse not only in the playback mode, but also in the record mode—a definite benefit. Among the recent comers with double auto-reverse are the Hitachi Model D-777 at about \$500, a model (number not available at presstime) from Akai at about \$500, and Sony Model TC-K96R at about \$620.

In checking out the comprehensive "candy-counter" display of state-of-the-art cassette machines, you'll see a few models with an extra complement of buttons. These will likely be units incorporating a microprocessor, in effect, a "mini-computer." They enable you to "program" a machine to perform certain functions, as for instance, individual musical selection search on a tape. Sharp, for instance, and its sister company, Optonica, have machines that feature Auto Program Locate Device—APLD that skips ahead or back to any song you select (up to 19 selections)

on a cassette, and plays it automatically. Sony in its Model TC-K60 at \$550 has "Automatic Music Sensor" for automatic playback of any one of nine tape selections (separated by non-signal intervals), with digital readout of preselection. Other companies are scheduled to offer some variations on these themes in the near future.

A few companies offer features that are exclusive to their products. These may be of special value to the serious sophisticated recordist, and as such, are worth investigating. AIWA, for one, offers "Synchro-Record" in its full-logic Model AD-6900U, priced at \$850. When used with AIWA's Model AP-2200 turntable, Synchro-Record activates recording automatically when the record is cued, and stops it when the tone arm lifts. Available as an option is a remote control. The AD-6900U also offers a feature found on only a handful of cassette decks—mic/line mixing.

Two-Speed Option. B.I.C. is the only cassette equipment manufacturer offering two-speed capability in its machines—four models priced from \$299.95 to \$849.95. They operate at the standard cassette speed of 1½ ips, plus 3½ ips. The faster speed results in dramatic improvements in frequency response, dynamic range, signal-to-noise ratio, and wow/flutter. The "Catch 22" is, of course, the use of twice as much tape for a given recording project, but the improvements to a super-critical buff may be well worth that. The two-speed

operation also results in quicker rewind and faster forward times at either speed.

Tape Optimization Modules. TEAC in its rack-mountable Model C-1 priced at \$1,300, offers an optional dbx interface module (DX-8) for recordists who prefer that system to the built-in Dolby of the machine. It has a selection switch for either system. The unit also has a proprietary approach to tape optimization; it incorporates interchangeable modules to match the deck's electronics to a specific brand of tape, and provides optional modules for additional tapes. Another feature valuable to the super critical recordist is a pitch control to synchronize a tape with certain musical instruments.

Automatic Spacing Pause. Our final exclusive feature of note is Mitsubishi's Automatic Spacing Pause System—ASPS, that automatically provides three seconds of silent tape between recorded selections at the touch of a switch. It is available in the firm's new trend-setting Model T-01, a micro-component model measuring a mere 10% by 5½ by 9½ inches, that matches a trio of separate components all measuring 10% inches wide and which are the first of many such products that will soon be a "big excitement" for the audio industry. The M-T01 features a windowless vertical front-loading system, a closed-loop dual capstan system, and solenoid-controlled tape transport controls. It is priced at \$560. ▲

OPERA: CHRISTA LUDWIG

(Continued from page 53)

in which she looked the seductress and sang with tones of purest honey, and a Dido in *Les Troyens* that was unforgettable in its heartstopping purity and voluptuousness all at the same time.

Miss Ludwig's career on records is long and distinguished, her voice one that has been captured with remarkable accuracy by recording engineers. In a veritable treasure trove of recordings, a favorite is impossible to pick, but there are certain performances at the top. One of these is certainly the Waltraute in *Götterdämmerung* for Karajan (DG 271 6001). She also recorded the same role in Sir Georg Solti's *Ring* (London OSA 1604), one of the few artists to do so, but the Karajan performance is preferable. In this reading of the great Narrative, she becomes the representative of all the troubles of Valhalla and yet pours out her pain within the bounds of a kind of classical antiquity rather unique in *The Ring*. The low tones, the middle and the high are exquisite to hear; there is richness on all fronts.

Another recording of equal value is

the *Tristan und Isolde* on Deutsche Grammophon, led by Karl Böhm and starring Nilsson (271 3001). No other album catches the sound of the Swedish soprano's voice as does this live performance, but equal to her is Miss Ludwig's Brangäne. She is at first a foil to Miss Nilsson, as human and warm as Miss Nilsson is furious; then in the "Einsam wachend" section, Miss Ludwig spins out the warning in a virtual definition of legato and control.

Of equal value is another Wagner role, one of the composer's most thankless, Venus in *Tannhäuser*. Here she joins forces ideally with Sir Georg Solti on London (1438), and the results are a Venus never yet encountered in the opera house. It is the embodiment of the sex goddess—not cold as some make her but passionate and boiling with the promise of every sensual fulfillment. Sir Georg uses the Paris version, so giving Miss Ludwig by far the richer Venus to sing; her "Komm, Geliebeter" is a clear connection to her Kundry in *Parsifal*, which she also recorded with Solti

(London 1510). Though the recording is not as exciting all round as the *Tannhäuser*, her performance is remarkable. Here, one runs into the problem of whether Kundry is right for the clearly mezzo timbre of Miss Ludwig's voice or whether it demands a dramatic soprano. Under normal conditions, I think a soprano is better because of its large number of high notes (the range is higher than that of the *Walküre* Brünnhilde), but in her case she sings it with such command, such ease in the high register and such overall conveyance of the seductress-saint's character that she is challenged on records only by Marta Mödl on the old London set.

The role that Miss Ludwig performed the most in New York (and possibly in Vienna and London) was her Octavian in *Der Rosenkavalier*, heard when the mezzo was very young on the famous recording with Elizabeth Schwarzkopf (Angel 3777). It has a special kind of freshness to it and though she later brought even more to the role, it is a fine recording

to have. In the last decade she has exclusively performed the Marschallin. To me, her interpretation has always been one of her weaker ones. As with so many singers, she works to act out the character, and does not really seem to let her life easily develop as it really should. She can be heard in an incredibly slow performance of this role with Leonard Bernstein (Columbia D4M-30652).

Her Wagner operas not discussed yet in which she gives memorable readings include the Solti *Die Walküre* (London 1509) in which her Fricka is a human, moving goddess, and the *Die Meistersinger* led by Rafael Kubelik (DG 271 3011) in which she sings a wonderfully rich and uncommonly expressive Magdalena. Wagner disciple Englebert Humperdinck furnished one of the great operas in the Wagnerian school when he composed his *Hansel and Gretel*, arguably the only pure Wagnerian opera by any-

one other than Wagner that works. In a casting unexperienced in any opera house but absolutely in keeping with the scoring, RCA cast Miss Ludwig as the Witch. She colors the whole recording properly, and the results are funny at the right times and musically interesting, which is more important. If you want to hear how unnecessary is the habit of casting a man to cackle in that role, listen to this recording (ARL 2-0637).

In an entirely different, but somewhat German-influenced opera, Camille Saint-Saens' *Samson et Dalila*, Miss Ludwig shows how persuasive she can be in French. Her Dalila is fascinating—warm, sensual, firm and diabolic in her inevitable, inescapable seduction (RCA ARL 3-0662).

With such an artist, of course, not all is perfect. Her recorded Mozart—both *Così fan tutte* and *Don Giovanni* (Elvira) as well as her portrayal of one of the ladies in *Die Zauberflöte*—

lacks the ideal timbre of voice and seems somewhat heavier than is ideal. She is also stylistically weak as Adalgisa on Maria Callas' second pressing of *Norma* (Angel S-3615), but she is interesting to hear.

Finally, there is a wonderful recording now out of the catalogue, which should be reissued. Miss Ludwig was never asked to record the role that made her most famous—the Dyer's Wife in *Die Frau ohne Schatten*. She did, however, record the Recognition Scene from *Elektra*, a scene from *Der Rosenkavalier* and the opening of the third act of *Frau* with her then-husband, Walter Berry. It is one of her finest recordings, showing all the expression and color in her remarkable voice. It was last available on RCA (VICS 1269), and it should be restored immediately to the catalogue. It is one of the treasures from one of the great recorded mezzo-sopranos of this era. ▲

CHOOSING BLANK TAPE

(Continued from page 42)

who sold you the tape.

Key manufacturers of ferri-chrome cassettes as of presstime include Ampex, BASF, Scotch and Sony.

Chromium dioxide tapes using man-made oxide particles "grown" to special size and shape, were pioneered by chemical giant DuPont and first marketed for audio use by Advent Corp. in 1970. They were intended to provide better high frequency response and better signal-to-noise ratios than those achieved by tapes then in existence.

Chrome tapes have their own specific CrO₂ bias position on modern cassette tape decks, or use the "high" setting, designated in various ways on older units. It uses 70 microsecond playback equalization, a standard feature on most quality home cassette decks and beginning to appear in car stereo equipment that is taking on the characteristics of home audio equipment.

Key suppliers of chromium dioxide tapes at presstime include Ampex, BASF, Capitol, Irish, Memorex, Radio Shack (Realistic brand), and Sony.

One of the first things to do before setting out to buy, is to define your recording goals and needs. If "basic" non-critical voice recordings is what you intend to do most, any tape, no matter how inexpensive, will fill your needs. If you are critical and will be doing primarily music recording, any high performance tape matched to your machine will serve you well.

The best advice we can give relative to buying cassette tapes is, *don't buy cheap* to save pennies. As with so many other consumer products, you get

what you pay for. Look for nationally-sold and advertised major "name" brands such as those pictured here.

In shopping for the right tape(s) for your recording needs, you will be confronted with all sorts of claims as to the superiority of this type of tape over that, in terms of one brand over another, etc. In our own experience, we've found that the best way to the truth is to do some sampling—within tape types, and once the best type is determined, within the brands handling that type.

One of the reasons for our suggesting the above approach, is that there are differences in hearing capability of music lovers and recordists. A tape that would satisfy one person's auditory apparatus would be inadequate to another's. For instance, if you are sensitive to high frequency sounds, you might find the "hot" high end of one type or brand of tape to be too much for your ears.

Another variable is the recording equipment which will be used with the tape you choose, in terms of quality and relative state-of-the-art technology it offers. A tape that might sound fine to a friend on *his* equipment and to *his* ears, might sound *better* (or worse), on *your* equipment and to *your* ears. Recommendations can only be regarded as very rough guidelines.

Another consideration is your recording capability. Buy the finest tape available, and it's only as good as your equipment settings—not only bias and equalization, but just as importantly, the *recording level* settings. Practice with these before doing serious record-

ing. Part of your practice procedure should involve checking a tape's "saturation"—its ability to absorb high signal levels without distortion. Optimizing this capability is in your hands—it depends on your setting of the recording level controls precisely. Better quality or premium tapes with higher saturation capability permit recording at higher levels without distortion. The better the tape quality, the less need to worry if the recording level indicators—whatever their form (meters, LED readouts, etc.)—move over into the "red zone" that warns of potential distortion.

Try **Manufacturers Recommended Tapes First**. About the only true reference point you have as you take off for your local audio/tape store is the list of tapes recommended for your machine by its manufacturer. But don't be surprised to learn that some of the tapes recommended may no longer be available. The blank tape industry is almost fanatical in its determination to outdo itself, steadily putting out ever-better products, reflecting the latest technological advances. If you like a particular brand of tape, one of which was recommended for your particular deck but is no longer available, ask the salesman if that tape was superseded—by a Mark Two (or Three) Series, that is designed to be even better than the tape originally recommended. All you need do then is to observe the specified bias and equalization settings required by the newer tape.

Earlier we mentioned that cassette machines of the future probably will

have a fourth bias/equalization position—to accommodate metal tapes. This prediction is based on the potential acceptance of these new and revolutionary tapes, the first of which are just beginning to enter the marketplace.

Metal Tape Avoids Overload Problems. Pure or fine metal particle tapes as they are designated in full, offer a few solid advantages for their markedly higher cost. In particular, they can record higher levels of sound at all frequencies thereby avoiding high frequency tape overload. Their dynamic range potential is far better than any other tapes now in the market, resulting in superbly realistic, balanced sound. In effect, cassettes will be able

to offer the kind of sound quality previously associated only with tapes made on first-rate reel recorders. Metal tapes represent the most significant advance in tape since the introduction of chrome tapes, in the opinion of experts.

But metal tapes have certain requirements that must be met in order to be utilized. Heads in today's cassette equipment cannot accommodate the metal tapes, thus new ones are being developed, as well as other technology to realize the potential of the new tapes. Hence, there will be an entirely new generation of decks equipped to record and play metal tapes. (It is not feasible to modify most existing equipment for metal tapes.)

Tandberg was the first to demonstrate a cassette deck with full metal tape capability. And scheduled for delivery this year are metal-tape-capable cassette decks from JVC, B.I.C., a Technics, and U.S. Pioneer.

Scotch brand "Metafine" tape was the first metal particle tape to be demonstrated, but once things get rolling, other major tape manufacturers are ready and poised to come on the scene.

Tape and tape equipment technology has just begun its "take off." We can look forward to new high levels of pleasure for music lovers who like to make and listen to their own tape recordings.

MOVING UP TO BETTER COMPONENTS

(Continued from page 47)

is the start of a trend, only time will tell.

Magnetic-head technology has improved recently as well. In addition to new materials such as Sendust to round out the metal and ferrite technology that has been used, we see several manufacturers using specially shaped polepieces to smooth out the low-frequency response and avoid the "head bumps" that occur in the response due to the contour effect.

Record-Playing Equipment

There's been a resurgence of interest in exotic separate tonearms. The idea is to reduce the effective mass of the arm and so to improve the tracking ability when playing warped records with a high-compliance cartridge. Appearances can be deceiving however. The new Shure/SME 3009 Series III looks like a boat anchor but, as the cartridge sees it, it's as light as a feather.

Not an awful lot is radically new in turntables. Most are now directly driven by servo motors although there are still some engineers convinced of the advantages of a belt drive. Variable-pitch is widespread with a strobe usually included to tell you when you're on the money. Some platters feature digital speed readout.

The manual platter has given way to the semi-automatic and fully-automatic single-play in pre-packaged units. The less you have to handle the delicate arm, the better. Modern automatic mechanisms move the arm more precisely and gently than you can, and, once the stylus is in the groove, the mechanism disengages so it doesn't drag. Mitsubishi automatics even sense the record diameter optically and position the tone arm accordingly. If you still have a completely manual system, consider modernizing. And if you want a changer, fear not. There are many

high-quality models on the market whose performance does not differ markedly from a good single-play.

There haven't been any dramatic changes in phono cartridges in the past several years but progress has still been made. Some manufacturers seem to be taking more note of the cartridge's interface with the rest of the system. Shure's V-15 Type IV sports a "Dynamic Stabilizer"—an appendage that serves to damp the tonearm resonance while discharging the record and cleaning the grooves. Stanton and Pickering are re-emphasizing the advantages of the brush attachment that their pickups have had for years. And top-of-the-line Ortofon cartridges that require higher-than-average termination capacitance now include a removable module that adds some of this capacitance right at the pickup. For moving-coil fans, there are a number of new cartridges that will appeal to them.

Loudspeakers

Recent moves in the loudspeaker area have emphasized "time-alignment," or "phase-coherence," or call it what you will. The idea is to get all of the various drivers to speak at the same time—or, more precisely, to get the sound from each of them to arrive at your ears at the same time. Since woofers are bigger and therefore deeper than midranges (which in turn are deeper than tweeters), when all drivers are mounted on the same baffle board, the sound emanates from different points. The low notes from the woofer start from a point well within the enclosure, a cone midrange speaks from slightly behind the baffle, a dome tweeter from the surface. The common way to "time-align" a speaker is to stagger the drivers so their effective speaking points line up on a common axis

There also seems to be a lot of cur-

rent interest in minimizing diffraction. When a sound wave reaches a sharp boundary, it tends to bend around it differently at different frequencies. Phantom sources are set up at the edge which in turn create diffraction patterns and upset the dispersion. So you'll see speakers with rounded edges and with foam inserts to absorb the radiation of these phantoms.

The advantage claimed for both time-aligned and minimum-diffraction systems is an improvement in stereo realism especially in the apparent image depth. This being a subjective quantity, it's best that you experience what it does for yourself. Having heard some of these systems myself, I can say that to my ears some of them *do* have an extraordinary ability to create a realistic stereo image.

More and more speakers are getting on the Thiele bandwagon. Although many enthusiasts still prefer the tight bass sound of an acoustic-suspension system, there is little question that you can achieve a better balance between efficiency, box size and bass response by "venting" the enclosure. Now that the various parameters can be optimized mathematically rather than by black magic, more Thiele-alignment type speakers are appearing. Some use ducted ports, others auxiliary bass radiators (also called passive radiators or drone cones). The result is the same—higher efficiency and deeper bass in a small box.

Accessories

From an obscure start, ambience simulators seem to be cropping up everywhere—even in automobiles. Audio Pulse and Sound Concepts are the two innovators of course, but now systems are available from Advent, Bozak, and others. Ambience simulators are designed to create a more spacious listening

(Continued on page 80)

LITERATURE LIBRARY

301. 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.

302. *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.

303. *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.

304. *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.

305. 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.

306. *Kenwood's* wide range of receivers, amplifiers, tuners, tape decks, stereo compacts, and speakers is described in a new brochure.

309. *JBL* offers four-color brochure which describes the nine loudspeakers which comprise their current line. Included are the L300, D44000 Paragon, L65, L212, L166, L110, L50, L40 and L19.

310. *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.

311. "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.

313. *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.

315. *TEAC* has designed a 16-page brochure which serves as a good introduction to multi-track recording. It's called *Are You Ready For Multi-track?* and it describes in detail the steps involved in making a good multi-track recording, delineates the equipment needed, and examines such recording stumbling blocks as the use of studio and PA microphones.

316. 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.

321. 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.

322. *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.

323. A free consumer guide to car audio is now available from *Panasonic's* Auto Products Division. Included in this 128-page paperback are tips on how to go about selecting the equipment you'll be happy with, what you need to know about specifications and features, how much power do you need, a directory of what equipment is offered by *Panasonic*, how to install it yourself, and a listing of *Panasonic* service centers nationwide.



324. 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.

327. *Tandberg* has an attractive color booklet displaying its tape decks, cassette deck, receivers, speakers and accessories.

328. *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 328 and let *Pioneer* do the rest.

330. Make your own evaluation of why *Acoustic Research* (AR) components, designed basically for home use, are often selected for critical professional and scientific applications.

331. *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.

332. *Sherwood Electronics Laboratories* has literature available on its full line of receivers, amplifiers, and tuners. Included are specifications and independent reviews.

337. 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.

338. *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.

341. *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.

342. A new four-color brochure from *VOR* describes in detail the inner workings of the patented automatic "dry" vacuum record cleaner—the *Vac-O-Rec*. It cleans by lifting dust and dirt with mohair brushes, and a fan blows them away.

344. *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.

345. *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.

347. *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.

348. *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.

349. 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.

HI-FI STEREO BUYERS' GUIDE, Dept. LL-20
Box 1849, G.P.O., New York, NY 10001

BE SURE TO ENCLOSE MONEY
March/April 1979

Please arrange to have the booklets whose numbers I have encircled sent to me as soon as possible. I enclose 25¢ for each group of 5 items, to cover handling (no stamps, please).

301	302	303	304	305	306	309	310	311	313	315
316	321	322	323	324	327	328	330	331	332	337
338	341	342	344	345	347	348	349			

Are you a subscriber to this magazine? Yes No

SPECIAL 50%-OFF 500 Enclosed is \$2.98 for 6 issues of HI-FI/STEREO
SUBSCRIPTION OFFER BUYERS' GUIDE. (Outside U.S.A. \$4). Allow 6 to
8 weeks for delivery of first copy. H9C 032

NAME (print clearly) _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

This offer expires August 29, 1979

Allow 4 to 6 weeks for delivery

environment—either by enhancing what reverberance there is (if any) in the recording, or by generating its own reverb artificially.

Opinion on ambience simulation is polarized—some can't live without it, others find that these devices blur the imagery. Best you listen and decide for yourself. Warning: if you get hooked on it, it may mean another pair of speakers and another amp although

some ambience simulators have the rear-channel amp built in and also come with speakers.

The accessories field is loaded with new toys—noise suppressors that strip the clicks, pops and crackles from your records, one-pass noise-reduction systems that serve to quiet the hiss on any program source, exotic parametric equalizers that not only offer the control range of a graphic equalizer but

also give you a handle on the width and frequency allocation of each band as well. The list can go on and on.

One glance over the lineup of high-fidelity equipment and accessories on the market convinces you that this is an alive, dynamic industry. Keeping up with it will keep you trekking back to the audio store at regular intervals and with a little advance preparation you can be sure of making a wise choice. ▲

SPOTLIGHT ON: AIWA AD-6900U

(Continued from page 48)

rule-flat response from 30 to 15,000 Hz in both the Dolby and non-Dolby modes.

As for the peak signal level meters: Unlike the common type of peak meter which indicates the absolute maximum record signal level, AIWA's peak meter is referenced to the 0-VU reading so there is extra headroom metering that allows for the high frequency record equalization. By following the supplied instructions for utilizing the peak metering, the results are exceptional. It is virtually impossible to distinguish the original signal source from the cassette recording.

The AD-6900U is a front-loading,

two-motor, three-head system machine supplied in a "home" metal cabinet. Rack panel and crash handle adaptors are available. Mixing microphone and line inputs are provided, and the line input is bridged to a front panel jack stereo-type phone jack. A memory reset counter provides either the usual off/stop arrangement, and automatic repeat play.

The tape mechanism is all-solenoid operation, allowing total remote control through a prewired remote control socket. No mention is made in the manual about a remote controller but one must exist because the socket is there. A timer control switch permits the deck

to be started via a powerline timer; either the play or record modes from capstan-disengaged preset.

The other, more common features are detailed in the test report elsewhere in this issue.

Summing Up. From every point of view the AIWA AD-6900U cassette deck delivers exceptional performance and convenience. As you might expect, it doesn't come cheap. The price tag is about \$800.00 for the basic machine; the rack mounting and crash handle options are extra.

For additional information on this exceptional machine, circle No. 102 on the Reader Service Card. ▲

JAZZ: THELONIOUS MONK

(Continued from page 20)

Monk's first recordings were made in 1941 during after-hours jam sessions at Minton's. The most famous of these sessions (recorded on a portable disc-recording machine by amateur engineer Jerry Newman) found Monk playing with considerable "technique" alongside Kenny Clarke and Charlie Christian. They have been issued repeatedly and identically, most recently as part of *Charlie Christian* (Archive of Folk and Jazz) and *Dizzy Gillespie Volume One*.

The heart of Monk's music, as might be expected from so innovative and iconoclastic an artist, is in his work as a leader. All of his earliest work in this vein is on: *The Complete Genius* (Blue Note), an essential collection with the first recordings (sometimes the only recordings) of many of his best pieces; a 1949 session by a pivotal group with Milt Jackson; and the beginnings of the Blakey-Monk partnership, which ripened considerably even during those years between 1947-1952.

Apart from a single alternate take of one piece, the twofer *Thelonious Monk* (Prestige) has all of Monk's 1952-1954 Prestige outings. The condition of the studio piano on most of these selections defies belief, but Monk wrings the utmost from it in mature trio and quintet performances, includ-

ing his remarkably spare version of "Smoke Gets in Your Eyes." All of this material has been scattered on an assortment of single records—*The Golden Monk*, *The High Priest*, *Reflections*, and *Blue Monk*—but the twofer is clearly the best buy.

Most of Monk's works from 1955-1960 have been reissued in twofers, but the earliest of these—low-key trio sessions with Oscar Pettiford—are only imported, as *The Unique Thelonious Monk* and *Monk Plays Duke Ellington* (both Japanese Riverside). *Brilliance* (Milestone) has a raw, almost primitive 1956 session with Sonny Rollins and Max Roach, and an underrated 1960 date with Thad Jones; the latter cut is also on *Five by Monk by Five* (Japanese Riverside). *Pure Monk* (Milestone) has the pianist working unaccompanied long before the Jarrett fad, and brilliantly in "I Should Care" and the blues "Functional." An earlier and less inspired solo session is now for sale as the identical *Thelonious Monk* (GNP), *Thelonious Monk* (Archive of Folk and Jazz) and *Pure Monk* (Trip). The fascinating Monk-Coltrane collaborations of 1957 are on *Monk/Trane* (Milestone). From the next year, Johnny Griffin bustles through long tenor saxophone solos, pushing Monk into the background of the "live"

At the Five Spot (Milestone); this combines the otherwise available *Misterioso* and *Thelonious in Action* (both Japanese Riverside). A better Monk-Griffin collaboration can be heard on *Thelonious Monk with Art Blakey's Jazz Messengers* (Atlantic), which has some of the pianist's most daring interplay with Blakey. And *In Person* (Milestone) is a more indifferent work from concert and club appearances, featuring some awkward attempts at orchestrating Monk for mid-size orchestra.

Ironically, Monk's celebrity in the mid-1960s, during his partnership with saxophonist Charlie Rouse, coincided with a repetitious and generally less rewarding period in his work. The most interesting albums from these years were the earliest, such as the warm and effervescent *Monk's Dream* and the brittle *Criss Cross* (both Columbia Special Products) with drummer Frankie Dunlon. Others include *Monk's Time* (Columbia) and *Solo Monk* (Columbia), another superb unaccompanied album. One record of *Who's Afraid of the Big Band Monk?* (Columbia) has another (and quite superior) effort at orchestrating Monk for ten pieces, but the other record of this set finds Monk with a complete big band in his worst record ever—also available as *Monk's Blues* (Columbia). *Underground* (Co-

CLASSIFIED MARKET PLACE

HI-FI STEREO BUYERS' GUIDE—PUBLISHED Bi-Monthly. The rate per word for Classified Ads is \$1.00 each insertion, minimum ad \$15.00 payable in advance. Capitalized words 40¢ per word additional. To be included next issue, write to R. S. Wayner, DAVIS PUBLICATIONS, INC., 380 Lexington Ave., N.Y. 10017.

BUSINESS OPPORTUNITIES

1000% PROFIT Bronzing Baby Shoes. Free Literature. NBC, Box 1904-DC, Sebring, FL 33870.

STAY HOME! EARN BIG MONEY addressing envelopes. Genuine offer 10¢. Linco, 3636-DA, Peterson, Chicago 60659.

WHOLESALE Rubber Stamp Outfits. Supplies. Catalog \$1.00. Martin, 1432D Major, Jefferson City, MO 65101.

\$300.00 WEEKLY, Mailing Circulars. Write: McGuire, Box 91064, Tacoma, WA 98491.

MAKE \$1.00 Each Addressing Envelopes. We pay postage. No Limit. Beginners Kit \$2.00. Colossal, Box 318-D, Brooklyn, NY 11204.

\$128.00 In Sales from \$12.00 Material. Write: Cew Company, 533B Wooster Road, Mt. Vernon, OH 43060.

NEW EXCITING BUSINESS. CONSOLIDATED GARAGE SALE, FLEA MARKET OR AUCTIONS. Start small at home, watch it grow. Write for Free details. SEMCO ENTERPRISES, DEPT. 45E, 288 Sundown Trail, Williamsville, NY 14221.

MAILORDER . . . \$2,000 monthly selling information by mail. Free Proof! Images, 550 Frontage, Northfield, IL 60093.

GUARANTEED \$480 weekly mailing circulars!!! Everything Supplied. Legal. Free Information: Rice Enterprises-A5, 3000 Montello, Bakersfield, CA 93306.

EARN EXTRA MONEY in your spare time mailing commission circulars. Rush a stamped addressed envelope for free details. RAL, Route #1, Ogdens, Iowa 50212.

\$5,000 Monthly Possible. Proven Mail Order Program. Rasmussen DP39, 1747N., 450E., Ogdens, UT 84404.

"REVEALED!!!" New "Success Guidebook: 1979"—All Incomes Inflation/Recession Foolproofed, \$3.00. Guaranteed, Amazing, Free-Information Catalogue—"Vistavision"—Barker, Texas 77413.

HUGE PROFITS selling gifts, novelties. Newberry, 1975A5 FM464, Seguin, TX 78155.

NEW BUSINESS CONCEPT. UNLIMITED OPPORTUNITY, part-time or full. 60 million Americans your clients. No competition. Operate from home. Immediate profits. Research Dynamics, Suite 201, 170 Broadway, NY 10038.

\$1,200.00 MONTHLY CORRECTING PUPIL'S LES-SONS!!! Start Immediately. Free Report. Send self-addressed stamped envelope. Home, Box 9201-SBBK, San Diego, CA 92109.

CAMPERS, CAMPING EQUIPMENT & TENTS

NEW! Patented CAR TOP KITCHEN. Information, pictures \$1.00. Car Top Kitchens Ltd. Dept. DP149, Box 429, New Berlin, WI 53151.

DO IT YOURSELF

PRICE BREAKTHROUGH. Do it yourself GIANT SCREEN t.v. projection kits. 5x6' pictures from your t.v. set. \$19.95 ppd. Mark V Marketing, Box 3002, Springfield, IL 62708.

EDUCATION & INSTRUCTION

GET INTO BROADCASTING: Become DJ, engineer. Start your own station, get free equipment, records. Free details "Broadcasting." Box 5616-G3E, Paradise, CA 95969.

COLLEGE degree by mail, via resume. Education, 255D South Robertson, Beverly Hills, CA 90211.

LEARN "HOW TO EASILY IMPROVE YOUR WRITING" by Dr. Benjamin White, a university professor. Send \$2.00 to Teach, Inc., Box 09468, Columbus, Ohio 43209.

INSTANT MEMORY . . . NEW WAY TO REMEMBER. No memorization. Release your PHOTOGRAPHIC memory. Stop forgetting! Free information. Institute of Advanced Thinking, 859DP Via-LaPas, Pacific Palisades, California 90272.

UNIVERSITY DEGREES BY MAIL! Bachelors, Masters, Ph.D.s . . . Free revealing details. Counseling, Box 389-HP-3, Tustin, CA 92680.

FARMS, ACREAGE & REAL ESTATE

AVOID PROPERTY TAXES using Federal law. Details \$4. Central Valley Information Service, Box 15145D, Sacramento, CA 95813.

HI-FI EQUIPMENT

GO To Bed With Music: Control I Automatically switches your system off. Works with Records, Tapes, Turners. \$60.00. Electromedia, P.O. 26B, Livingston, NJ 07039.

SAVE 50% BUILD YOUR OWN SPEAKER SYSTEM. Write McGee Radio Electronics, 1901 McGee Street, Kansas City, MO 64108.

HYPNOTISM

FREE Fascinating Hypnosis Information! Startling! DLMH, Box 487 Anaheim, CA 92806.

INVENTIONS WANTED

INVENTIONS, patents, wanted cash, royalty. Auto, electro-mechanical, mechanical devices, Housewares, etc. We develop, finance, manufacture and market from an idea to perfected product. Free evaluation and brochure. Request Kit DP, Pixicon Corporation, 250 West 57th Street, New York, New York 10019.

JEWELRY

COLORFUL 48 page jewelry catalog. \$1 refundable. Russo, Box 1106-D, Wayne, NJ 07470.

LOANS BY MAIL

BORROW \$25,000 "OVERNIGHT." Any purpose. Keep indefinitely! Write: Success Research, Box 29263-SO, Indianapolis, IN 46229.

GET cash grants—from Government. (Never repay.) Also, cash loans available. All ages eligible. Complete information, \$2 (refundable). Surplus Funds-DG, 1001 Connecticut, Washington, DC 20036.

FINANCING! \$1,000-\$50,000 available—"overnight." Entirely by mail. Any purpose. Repay anytime. Incredibly low interest. No collateral, co-signers, special conditions. Full information, \$2 (refundable). Spectrum, 79 Wall St.-16F2, New York 10005.

MACHINERY, TOOLS & SUPPLIES

AMAZING NEW MINI-HOE, steel adjustable rake attachment, HOES weeds, plants, cultivates, without changing tools. RUSH \$1.95 ppd. T. J. WEYMER, RD #1 BOX 134-A, ASHVILLE, PA 16613.

MAIL ORDER OPPORTUNITIES

BEST Mail Plan Yet. Terrific Sales. Simple instructions. Most anyone can handle. Andy's, POB 318, Sptbs, SC 29304.

\$500/THOUSAND immediately, stuffing envelopes, free supplies. Rush stamped, addressed envelope. L&M Kellander, P.O. Box 25, Talmage, PA 17580.

MISCELLANEOUS

FREE! HUNDREDS of things yours, just for asking. Revealing 62 page report, \$3.00. D&W Enterprises, 13504 Hillendale Drive, Woodbridge, VA 22183.

SUCKERS LOSE—PLANNERS WIN. Sure Fire Bar Bets \$3.00. Phoenix Books, P.O. Box 17331, Washington, D.C. 20041.

MONEYMAKING OPPORTUNITIES

\$350 WEEKLY Mailing Letters. FREE Details. Karmchell, 628FD Cherry, Albany, GA 31701.

AMAZING! \$265,000 Yearly with classified ads. Free Proof. Moneycraft, 2316 Dale, Ceres, CA 95307.

\$500 WEEKLY! FANTASTIC HOME MAILORDER PROFITS! (DEALERS WANTED) GRAHAMCO DPBX, 99371 TACOMA, WA 98499.

EXCELLENT SECOND INCOME OPPORTUNITY. FREE DETAILS. STAMP APPRECIATED. Hanson, 5423 Rushhill, San Antonio, TX 78238.

Amazing Profits! Woodworking! Information! Charles Pollard, 27 Snowhill, Agincourt, Ontario M1S 3T4.

YOU could make \$3,500 monthly. Free details send 15¢ stamp. George, Box 508, McAllen, TX 78501.

\$200 WEEKLY stuffing envelopes spare time possible. Details, stamped, self-addressed envelope. Mail Sales-I, 8023 Leavenworth Rd., Kansas City, KS 66108.

\$180.00 WEEKLY Mailing Circulars. Start Immediately. Eveready, 422A Clermont Ave., Brooklyn, NY 11238.

MONEYMAKING OPPORTUNITIES—Cont'd

DISC Jockey Training Manual. Earn \$150 Night. Pro-D.J., P.O. Box 146, Whitby, Ontario, Canada L1N 5R7.

\$250.00 profit/thousand possible-stuffing-mailing envelopes. Offer: Rush stamped addressed envelope: Universal-ADVS X16180 Port Lauderdale, FL 33318.

\$300 WEEKLY SPARE TIME—Mailing Salesletters. Details. Thomas, Dept.-D, Box 11773, Charlotte, NC 28220.

MAKE YOUR CLASSIFIED AD PAY. Get "How to Write A Classified Ad That Pulls" Includes certificate worth \$2.00 towards a classified ad in this publication. Send \$1.50 (plus 25¢ for postage) to R. S. Wayner, Davis Publications, Inc., Dept. CL, 380 Lexington Ave., New York, NY 10017.

2000.00 MONTHLY possible stuffing envelopes! Details, send stamped self-addressed envelope. Craft, Box 3419D, Mission Viejo, CA 92690.

\$500 CASH ADVANCE: stuff 1000 envelopes. Information: SASE. Freedom M145, Box 1060, Orange Park, FL 32073.

NOW Horse Players earn unlimited Profits with "Professional Winning Systems." Free information! Publishers, P.O. Box 546, El Cajon, CA 92922.

PEN PALS

JOIN North America's leading penpal club. Details from Friends Worldwide CP-95/F Anjou, Montreal, H1K 4G5.

PERSONAL

CONFIDENTIAL Introductions. Both sexes—description \$1.00. Cosmos, Box 1018, Longwood, Florida 32750.

DATES GALORE! Meet singles-anywhere. Call DATELINE, toll-free (800) 451-3245.

SINGLE? Widowed? Divorced? Nationwide Introductions! Identity, Box 315-DC, Royal Oak, MI 48068.

JAPANESE Girls Make Wonderful Wives. We have large number of listings. Many interested in marriage. Only \$1.00 brings application, photos, names, descriptions, questionnaire, Etc. Japan International, Box 156 AA, Carnelian Bay, CA 95711.

BEAUTIFUL Mexican-Oriental girls Needing American Boy-Friends. Free Details. "Actual" photos. World, Box 3976-DC, San Diego, CA 92103.

MEET Sexy Swingers Nationwide. Free details. (State age). Gateway, Box 338-DC, Lafayette, CO 80026.

JAPANESE introductions! Girls' photographs, descriptions, brochure, details, \$1.00 INTER-PACIFIC, Box 304-SC, Birmingham, MI 48012.

FREE: 1,000 LADIES PHOTOS. World's largest Matrimonial Catalog. Postage/Handling \$1.00. Inter-contact, Box 12, Toronto, Canada M4A 2M8.

BEAUTIFUL Mexican girls; romance, marriage, descriptions \$1.00. Cosmos, Box 1018, Longwood, Florida 32750.

PHOTOGRAPHY — PHOTO FINISHING & SUPPLIES

SAVE HUNDREDS OF DOLLARS!!! Make your own S & M Denalometer. Send \$3.00 for detailed drawings and instructions. A must for successful photography in your darkroom. Order direct: S & M Instruments Dept. H.F.-3, 380 Lexington Ave., N.Y., NY 10017.

RADIO & TELEVISION

LINEAR AMPLIFIERS 25-100 watt solid state. OMNIPOLARIZED BASE ANTENNAS. Portable/mobile/memory/300 MHz FREQUENCY COUNTER. Construction plans: \$3.00 each. \$37.50. Specify frequency band! Kits available. Free catalog! PANAXIS Box 130 G3E, Paradise, CA 95969.

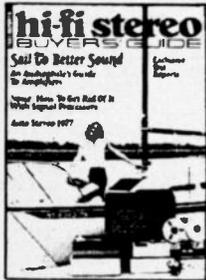
SALESMEN—DISTRIBUTORS

STEREO DEALERS WANTED to buy at wholesale and sell on campus for profit. For immediate information write: The Sound Outlet, 35 Whitfield Rd. West Somerville, MA 02144.

WORKCLOTHES

WORK PANTS \$3. Coveralls \$6. Postpaid. Catalog \$1 (refundable with order). Workmen's Garment Co., 15205-DP Wyoming, Detroit, MI 48238.

Hi-Fi/Stereo BUYERS' GUIDE gives you the absolute tops in number of equipment test reports per issue. We don't just test the top of the line, we report on all levels of more manufacturers' lines than any one else.



If you're a "best-buy" buyer, don't miss a single issue!

Mail this coupon to:
Hi-Fi/Stereo BUYERS' GUIDE
 Box 1855 GPO
 New York, NY 10001

Enclosed is \$2.98 for 6 issues of HFSBG (outside U.S.A., possessions send \$4.00)

Name _____

Address _____

City _____

State _____ Zip _____

SAVE \$2.97 off regular subscription rate.
 \$5.12 off newsstand rate.

H9B042

HI-FI STEREO BUYERS' GUIDE INDEX TO ADVERTISERS

READER SERVICE NO.	ADVERTISER	PAGE NUMBER
4	Akai America Audio	13
17	AKG Acoustics	29
9	Audio Technica	6
8	Audio Technica	25
6	Bose Corporation	CV3
11	Dahlquist	14
12	DBX, Incorporated	4
13	Discount Music Club, Inc.	12
—	Discwasher, Inc.	CV2
39	Electro-Voice, Inc.	18
14	Epicure Products Incorporated	23
15	Finnay Company	20
35	Hitachi Sales Corporation	11
16	J & R Music World	12
18	Koss Corporation	5
19	McIntosh Laboratory Inc.	10
34	Mitsubishi Car Audio	16, 17
20	Nikki Audio	22
21	Ohm Acoustics	3
22	Panasonic	CV4
23	Studer Revox America, Inc.	32
24	SAE	21
25	Sansui	27
28	Sharp	38
41	Shure Bros	8
29	Shure Bros	9
5	Sony Corporation	7
38	Sound Concepts	22
36	Speaker Labs	24
30	Stanton	31
26	TDK	15
42	Toshiba	1
27	United Audio	19

Please support our efforts. **American Cancer Society**

lumbia) is of interest for its many new compositions, written in a period when most of Monk's recordings suffered badly from a lack of new repertoire. There is no need to demean the likes of *Monk, Misterioso* and *Straight No Chaser* (all Columbia); these records simply add little to the profile provided by Monk's better work. And like most similarly named collections, *Monk's Greatest Hits* (Columbia) does not cover Monk's greatest achievements.

Recording-date attempts as a co-leader—*Mulligan Meets Monk* (Japanese Riverside) from 1958 with Gerry Mulligan, and a 1961 Newport Jazz Festival session with Pee Wee Russell on half of *Miles and Monk at Newport* (Columbia)—were notable mostly as novelties.

Monk's recordings as a sideman have been rare. His first studio recordings with Coleman Hawkins, his first major

employer, are duplicated on *The Hawk Flies* (Milestone) and *Bean and the Boys* (Prestige). He gives reserved support to thrilling solos by Charlie Parker and Dizzy Gillespie on *Charlie Parker: The Verve Years 1950-1951* (Verve). An interesting but short session with an inappropriate saxophonist, Gigi Gryce, is part of *Signals* (Savoy), and half of Clark Terry's *Cruising* (Milestone) finds Monk in relaxed 1958 form. Best of all of Monk's work with other leaders is the famous 1954 Miles Davis session with Milt Jackson, available by itself on *Modern Jazz Giants* (Prestige) and on *Tallest Trees* (Prestige) with other Davis selections. "Bar Groove" and "The Man I Love" in this session are perfectly balanced examples of the deliberation and spontaneity that make up the best jazz performances at once so satisfying and so inimitable. ▲

SOUND PROBE: CELESTION

(Continued from page 28)

ing naturalness of instrumental tone color. You'd expect this from the unusually flat frequency response, but it still comes as a surprise and particularly benefits the strings. This makes the Celestion attractive to classically oriented listeners, since the sound of stringed instruments is the basic substance of symphonic scoring as well as of most chamber music. Transient response, as evident in piano solos, is exceptionally clean, and the smooth overall response allows the transients to come through with all their natural sharpness but without any exaggerated "bite."

It is precisely this inobtrusive, almost reticent quality, that will delight some listeners while perhaps puzzling others accustomed to a more aggressive kind of sound. We were impressed by the speaker's ability to handle orchestral climaxes without the least perceptible change of coloration—probably a

function of its heavy magnets, which take power peaks easily in stride.

As for bass, it is definitely present all the way down to the very bottom, but it is rather discreet. Listeners liking their bass a bit more on the gutsy side will have to crank up the bass control on their amplifier. Thanks to its exceptional linearity of response, the Celestion will accept this boost without booming. The instructions suggest that the speaker should be placed off the floor and be kept out of corners to avoid possible room resonance at low frequencies. But in our listening tests (and with our particular room acoustics) we found that floor placement adds body to the otherwise pale bass—and frankly, we liked it that way.

In sum, we expect the Celestion 33 will appeal mainly to listeners with a classical bent who appreciate its polite refusal to dramatize the sound, letting musical reality speak for itself. ▲

SOUND PROBE: WHARFEDALE

(Continued from page 28)

tion—a setting which made everything sound just fine.

And we do mean everything. The E-50 was right at home with—and on top of—some far-out jazz, full of shining brass and biting percussion. But it also spelled out subtle touches of guitar, not spoiling the softness of such sounds. Human voices remained human, with no false treble edging their natural timbre. The piano sounded bright without being clangy.

The E-50 also did well with the classics, putting clean bass under symphonic scores and sorting out the in-

struments very nicely. The strings, we felt, didn't have much warmth. But they weren't harsh, either—just cool and accurate.

The treble fanned out evenly, letting us move almost anywhere in the room without feeling much change in tonal coloration. So you aren't bound to any particular listening location for proper tonal balances. Yet at the same time, there was enough source definition for accurate stereo imaging. In short, here is a quality speaker of unmatched efficiency, adding new lustre to one of the oldest names in audio. ▲

The Bose® 901® Series IV: A new approach to room acoustics creates a major advance in performance.

It's well known that living room acoustics are a major factor in how any speaker will sound in your home. Recently, an ambitious Bose research program analyzed speaker performance in dozens of actual home listening rooms. The study showed that, while rooms vary greatly, their prin-

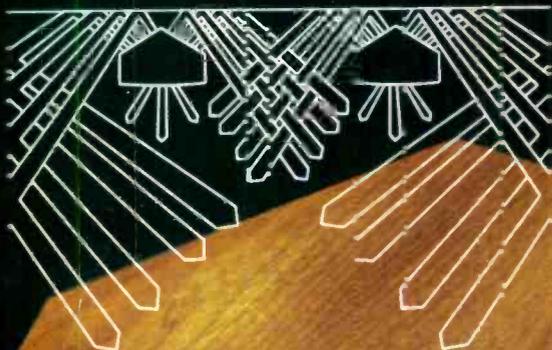
cipal effects can be isolated to specific types of frequency imbalances.

Based on this research, the electronic Active Equalizer of the new Bose 901® Series IV speaker system has been totally redesigned. New controls allow greater capability for adjustment of room factors

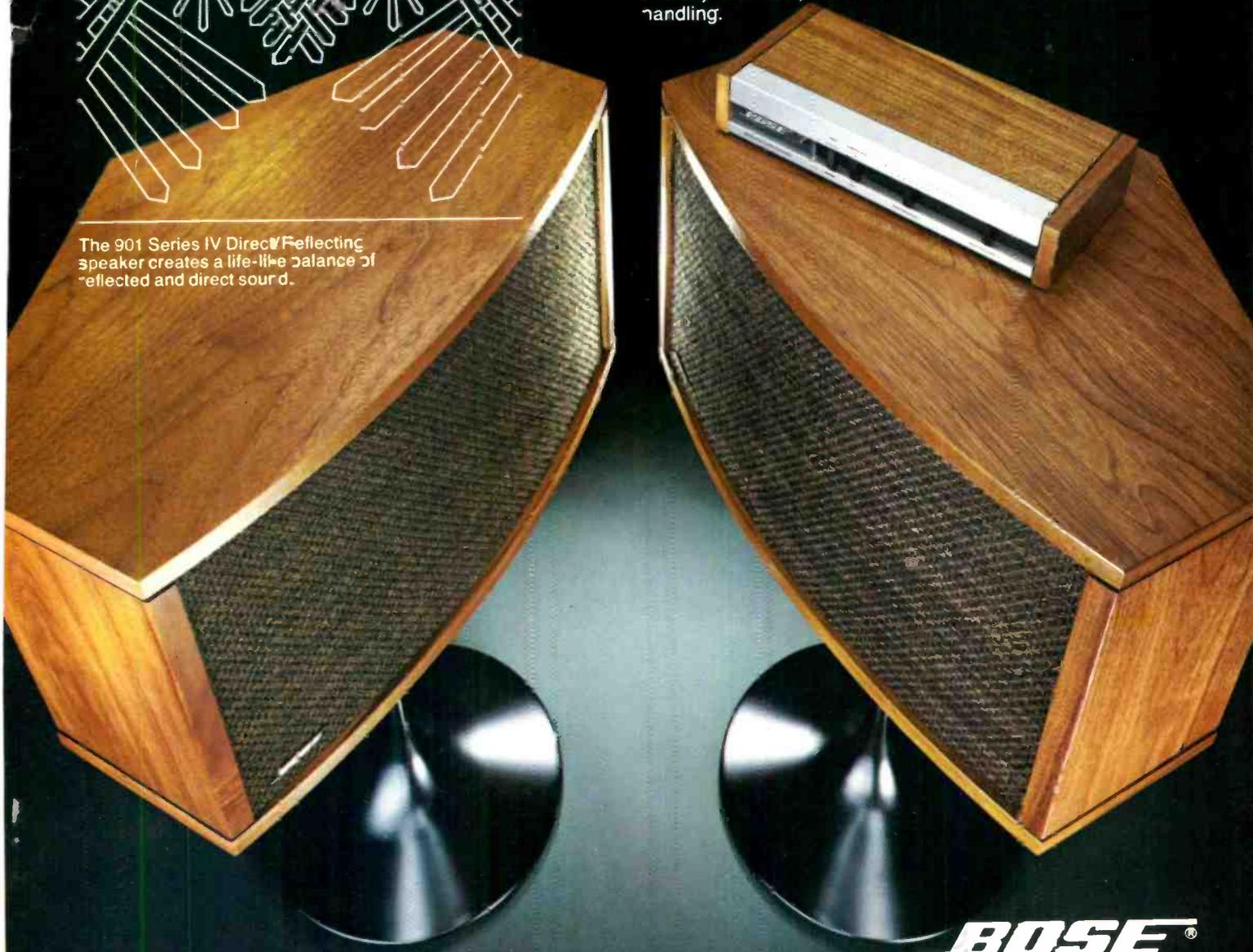
than conventional electronics, and make possible superb performance in almost any home listening room.

These new room controls also let us develop a basic equalization curve with no compromises for room effects, allowing still more accurate tonal balance. In addition, an important improvement in the design of the 901 driver makes possible even greater efficiency and virtually unlimited power handling.

These innovations combine with proven Bose concepts to create a dramatic advance in performance: in practically any listening room, with virtually any amplifier, large or small, the 901 Series IV sets a new standard for the open, spacious, life-like reproduction of sound that has distinguished Bose Direct/Reflecting® speakers since the first 901.



The 901 Series IV Direct/Reflecting speaker creates a life-like balance of reflected and direct sound.



BOSE®
The Mountain, Framingham,
Mass. 01701

Covered by patent rights issued and pending.

Circle No. 6 On Reader Service Card

Technics

When it comes to turntable speed accuracy, we agree with our competitors. You can't beat quartz-locked direct drive. But when it comes to total turntable performance, many professionals agree. You can't beat Technics.

That's why so many radio stations and discos use Technics quartz-locked turntables. Because they need performance like wow and flutter of 0.025% WRMS, rumble of only -78 dB (DIN B), and speed accuracy of $\pm 0.002\%$. Those are impressive specs. And if you've wondered why you don't see specs like these in our competitors' ads, it's usually because you won't find them in our competitors' turntables.

You will find these specs in Technics new 5000 Series: the SL-5100 manual, the SL-5200 semi-automatic, the SL-5300 automatic (shown below) and the SL-5350 changer. Along with a lot more.

Like a full-cycle detection servo system packed into three high-density IC "chips." It assures proper rotational speeds, even under heavy loads. And TNRC, a unique Technics Non-resonant Compound virtually eliminates feedback.

At the same time, a highly sensitive statically balanced "S"-shaped tonearm drastically reduces friction to only 7 mg on both vertical and horizontal planes.

Each turntable features a prism-stylus illuminator to help prevent miscues. While front-panel controls with damped cueing make operation easy, even with the dust cover closed. There's also an anti-skating control. And pitch controls variable by $\pm 6\%$.

Now you know what many discos and radio stations already know: Quartz isn't the last word in turntables, Technics is.

Many hi-fi buffs think quartz is the last word in turntables. Technics knows it's just the beginning.

