Test Record Library

Audio

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • MARCH 1974 75¢ ® ©
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S R SPEAKER SYSTEMS.

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PIONEER'S NEW SERIES

An acoustic achievement th
universally preferred sou

R700

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The critics unquestionably agree...

AUDIO (George Tillett)
"The Pioneer R300 is a rather unusual speaker system — both in styling and design . . . Bass was solid and tight . . . the sound had an immediate projected quality. Stereo image was excellent . . . Can be recommended to those who require a good system at a reasonable price and one that would give outstanding results from a modestly powered receiver."

STEREO & HI-FI TIMES (Larry Zide)
" . . . This (R500) speaker will please many with its big, bright sound . . . The middle ranges . . . are most prominent, but there is more than enough good bass, too . . . The high end response is excellent; midrange and tweeter contribute to a smooth, wide range sound that goes well beyond audibility . . . It's time that we began to demand appearance along with performance. This, Pioneer is certainly giving us with this model, and they are to be commended for the effort . . . The R500 is a quality speaker and deserves your attention."

HIGH FIDELITY (CBS Laboratories)
"The R700 did a fine job with any program material we fed into it . . . The clean, smooth, honest, wide-range performance of the R700 puts it unquestionably among the more attractive speakers in its class."

MODERN HI-FI & STEREO GUIDE (Robert Angus)
"There are some important differences between the R series . . . and most other bookshelf speaker systems on the market . . . The R500 is designed to make electronic rock music sound more dramatic . . . There's no doubt that with either folk or rock music, these speakers really produce brilliant sound . . . bass is remarkably clean and full under any circumstances . . . Sound is clean and undistorted up to 18,000 Hz . . . at the low end, clean frequency response is measurable down to 22 Hz."

FM GUIDE
"If you think it's time for a new sound sensation and you suspect your present speaker system is holding out on the lows and highs, try Pioneer's R500 speaker system."

OPERA NEWS (Hans Fantel)
"The cadre of relatively low priced high-performance speakers has recently been augmented by a distinctive newcomer: Pioneer's R300, whose tonal characteristics have been tailored to the results of extensive preference-testing with large groups of listeners. The R300 has a quality of 'presence' and immediacy which made Salome's murderous ecstasies positively scary when I listened, and the massive sonorities of the Strauss score didn't faze this speaker a bit."

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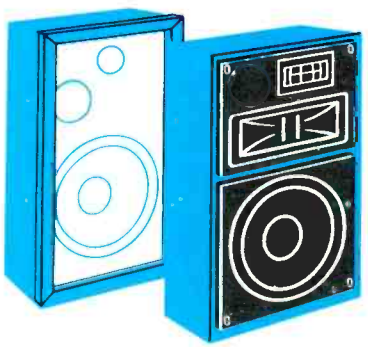
Too often these days superlatives are used to camouflage mediocrity. Let's just say you'll be excited with the magnitude of the achievement of the new Pioneer series R speaker systems, once you hear them. They represent the culmination of our more than six years of intensive research in every phase of speaker design on just this series alone.

We investigated, tested and evaluated every known area: frequency response, dispersion, distortion, transients, drivers, configurations, cabinetry — rejecting, accepting, improving until we were completely satisfied that we had the perfect combination. The sound most people would prefer when compared with the conventional speakers now available.

The story behind the grille

To achieve this exceptional sound reproduction, Pioneer has endowed the new series R with a host of meaningful refinements that have become the hallmark for our extensive collection of high fidelity components.

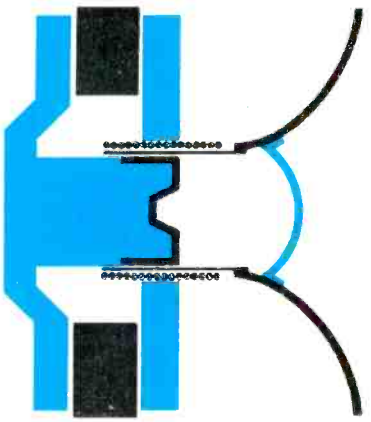
Flush mounting. Unlike other speaker systems on the market today, the R series' drivers are flush mounted to the face of the enclosure, rather than recessed. Combined with the advanced design of the individual speaker units, there is added vitality to the mid tones and wider dispersion.



Conventional recessed speaker mountings. **New up-front flush mounting of Pioneer series R.**

Exclusive FB cones assure robust bass, clear mid and high tones, improve damping, while keeping distortion at an absolute minimum. High input signals are handled with complete ease.

	R700	R500	R300
Speakers	12″ woofer, midrange horn, multicell horn super tweeter	10″ woofer, 5″ midrange, horn tweeter	10″ woofer, horn tweeter
Maximum Input Power	75 watts	60 watts	40 watts
Crossovers	750 Hz, 14,000 Hz	800 Hz, 5,200 Hz	6,300 Hz
Dimensions	15″ x 26″ x 13 9/16″	13 3/4″ x 24″ x 12 1/16″	13″ x 22 1/2″ x 11″
Price	$229.95	$159.95	$119.95



Unique concave center pole design and pure copper cap/ring combination. The concave center pole of the drivers' magnetic structure is covered with a pure copper cap. Not only does this reduce the inductance of the voice coil, it also decreases the voice coil's intermodulation distortion generated by the magnetic field. The result: vastly improved bass and midrange transient responses. Another example of Pioneer's meticulous engineering detail.

Improved design horn tweeters of die-cut aluminum have completely replaced the more conventional (and less costly) cone and dome-type tweeters in the entire series. You can hear the difference with wider dispersion, and you gain all the advantages of horn drivers, such as high transient response and lowest distortion.

Crossovers are precisely designed in each model. In contrast to other speakers that rely on the capacitance method only, Pioneer has combined both inductances and capacitances for minimum intermodulation distortion. And you'll never hear bass tones wandering to the tweeters, or highs intruding on the woofers. You couldn't ask for better linear response.

The acoustically padded enclosures are sturdily built and faced with handsome two-piece, two-color, removable grilles. The staining process of the hand selected walnut requires ten steps alone, and utilizes an exclusive oil created by Pioneer. Each unit is produced as if it was the only one.

Sound-absorbing foam polyurethane surrounds the woofers of the R700 and R500 to reduce distortion even further. The three R series models each employ long-throw voice coils providing greater cone movement for higher excursions.

There are many technical reasons why you should buy a pair of the new Pioneer series R speakers systems. But, in the final analysis, when you compare them with comparably priced speakers at your Pioneer dealer, their absolute superiority in sound reproduction is why you will buy them.

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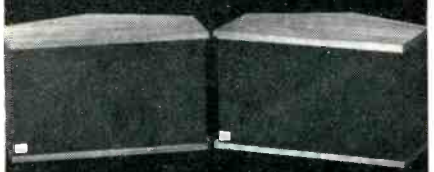
You're reading this page for the same reasons we build our speakers.



Better music, wherever you listen. Real fundamental, bass, including the attack of tympani and organ. An almost tactile feeling of presence. And transparent highs, providing unusual instrumental definition.

First and foremost, we built the LDL 749A to satisfy our own desire for musical enjoyment. Including the spatial sensations: from the intimacy of small groups to the awesomeness of full orchestra.

With their precise combination of forward-radiated sound and panoramic reflection, LDL 749A are a compact, elegant way to put the concert hall in your listening room. And the price is as realistic as the sound!

Linear Design Labs inc.

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AUDIO

MARCH 1974 *Successor to* RADIO *Est. 1917* Vol. 58, No. 3

FEATURE ARTICLES

EQUIPMENT PROFILES

RECORD REVIEWS

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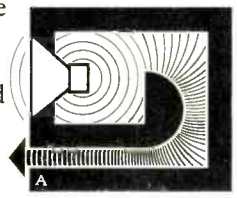
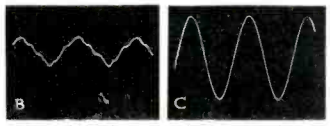
Now BIC VENTURI™ puts to rest some of the fables, fairytales, folklore, hearsay and humbug about speakers.

Fable

Extended bass with low distortion requires a big cabinet.

Some conventional designs are relatively efficient, but are large. Others are small, capable of good bass response, but extremely inefficient. The principle of the BIC VENTURI systems (pat. pend.) transforms air motion velocity within the enclosure to realize amplified magnitudes of bass energy at the BIC VENTURI coupled duct as much as 140 times that normally derived from a woofer (Fig. A). And the filtering action achieves phenomenally pure signal (Scope photos B & C). Result: pure extended bass from a small enclosure.





B—Shows output of low frequency driver when driven at a freq. of 22 Hz. Sound pressure reading, 90 dB. Note poor waveform.

C—Output of venturi coupled duct, (under the same conditions as Fig B.) Sound pressure reading 111.5 dB, (140 times more output than Fig. B.) Note sinusoidal (nondistorted) appearance.

Fairytale

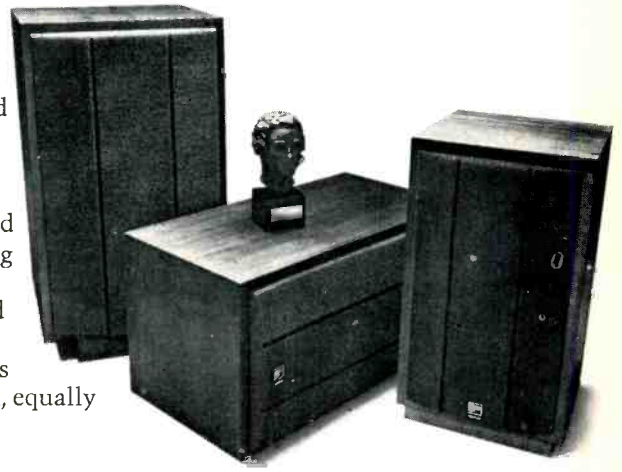
It's okay for midrange speakers to cross over to a tweeter at any frequency.

Midrange speakers cover from about 800 Hz to 6000 Hz. However, the ear is most sensitive to midrange frequencies. Distortion created in this range from crossover network action reduces articulation and musical definition. BIC VENTURI BICONEX horn (pat. pend.) was designed to match the high efficiency of the bass section and operates smoothly all the way up to 15,000 Hz, without interruption. A newly designed super tweeter extends response to 23,000 Hz, preserving the original sonic balance and musical timbre of the instruments originating in the lower frequencies.

Folklore

Wide dispersion only in one plane is sufficient.

Conventional horns suffer from musical coloration and are limited to wide-angle dispersion in one plane. Since speakers can be positioned horizontally or vertically, you can miss those frequencies so necessary for musical accuracy. Metallic coloration is eliminated in the BICONEX horn by making it of a special inert substance. The combination of conical and exponential horn flares with a square diffraction mouth results in measurably wider dispersion, equally in all planes.



Hearsay

A speaker can't achieve high efficiency with high power handling in a small cabinet.

It can't, if its design is governed by such limiting factors as a soft-suspension, limited cone excursion capability, trapped air masses, etc. Freed from these limitations by the unique venturi action, BIC VENTURI speakers use rugged drivers capable of great excursion and equipped with voice coil assemblies that handle high power without "bottoming" or danger of destruction. The combination of increased efficiency and high power handling expands the useful dynamic range of your music system. Loud musical passages are reproduced faithfully, without strain; quieter moments, effortlessly.

Humbug

You can't retain balanced tonal response at all listening levels.

We hear far less of the bass and treble ranges at moderate to low listening levels than at very loud levels. Amplifier "loudness" or "contour" switches are fixed rate devices which in practice are *defeated* by the differences in speaker efficiency. The solution: Dynamic Tonal Compensation.™ This circuit (patents pending) adjusts speaker response as its sound pressure output changes with amplifier volume control settings. You hear aurally "flat" musical reproduction at background, average, or ear-shattering discoteque levels—automatically.

A system for every requirement

FORMULA 2. The most sensitive, highest power handling speaker system of its size (19¾ x 12 x 11½)." Heavy duty 8" woofer, BICONEX mid range, super tweeter. Use with amplifiers rated from 15 watts to as much as 75 watts RMS per channel. Response: 30 Hz to 23,000 Hz. Dispersion: 120° x 120°. $98 each

FORMULA 4. Extends pure bass to 25 Hz. Has 10" woofer, BICONEX midrange, super tweeter. Even greater efficiency and will handle amplifiers rated up to 100 watts. Dispersion: 120° x 120°. Size: 25 x 13¼ x 13." $136 each.

FORMULA 6. Reaches very limits of bass and treble perception (20 to 23,000 Hz). Six elements: 12" woofer complemented by 5" cone for upper bass/lower midrange; pair of BICONEX horns and pair of super tweeter angularly positioned to increase high frequency dispersion (160° x 160°). Size: 26¼ x 15¾ x 14¾." $239 each.

Sturdily constructed enclosures. Removable grilles in choice of 6 colors. Optional bases for floor standing placement. Write for brochure A-3.

Audition today's most advanced speakers at your BIC VENTURI dealer.

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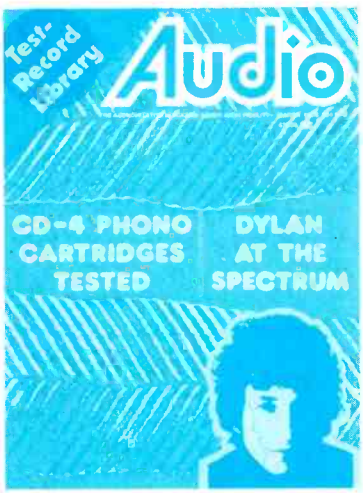
Special Tape Recorder Issue All About "Q"—Don Davis, of Syn-Aud-Con, explains how to figure speaker directivity and why it is important.

Guide to Folk Music Labels—Ira Mayer discusses the modern-day folk process.

Equipment Reviews Include—Pioneer SX-949 four-channel receiver Technics SL-1200 turntable.



About the cover: Not many people have eyesight as sharp as our artist who looked down into the grooves of a CD-4 Quadradisc and shows us what he saw. (Actually, this is a color conversion of a 1500X scanning electron microscope photo of a CD-4 disc's grooves, photo courtesy of RCA Victor.)

Audioclinic

Joseph Giovanelli

Using a VU Meter to Read Power Output

Q. In two super-power, basic amplifiers, specifically, the Phase Linear 700 and Phase Linear 400, "VU meters" are used to indicate power output during complex musical passages. These meters are calibrated in decibels in much the same way as my Simpson 270-4 Volt-Ohm-milliammeter is. Is it possible to connect this meter to the speaker outputs to determine the output of the amplifier during complex passages? If this can be done, what power level, in watts, does 0 VU refer to?—Phil Saba, McLean, Virginia

A. It would be possible to use your meter to indicate average power output produced by an amplifier. The only catch is that the damping of the meter might be different from that of a standard VU meter. If it is, you will miss some of the peaks which should register, or you will read peaks which are higher than those which would have been obtained on a standard VU meter. VU meters are designed to have a particular characteristic of attack and "fallback" in order that an indication on one meter will be equal to that read on any other similar meter associated with the chain of equipment.

In any case, assuming that your meter has reasonably good dynamic characteristics, it should be possible to use it with any amplifier to indicate power output. You must watch out for the possibility of ruining the meter with excessive signal. (While my following comments deal basically with VU meters which require external multipliers, they more or less apply to your specific meter. Its internal multiplier may be used, but some additional external, variable resistance will be required for trimming.)

VU meters are designed to respond to signals of less than 10 mW. This is a very small amount of power. You would have to calibrate your amplifier in terms of voltage versus power output. You also need to know the ohms per volt of your meter. You would then have to provide a multiplier, similar to what would be contained in a VOM or VTVM, to fit the full-scale voltage of 0.707 volt which causes a standard VU meter to deflect to 0 VU. This voltage could either be made equal to the full power output of the amplifier, to a point which is 3 dB less than this full power or equal to perhaps the loudest listening level you might expect to use—whichever best suits your requirements. You would want to make a portion of the divider—or multiplier as you will—variable for exact calibration and interchannel balance.

Reception of Distant FM Signals

Q. I like to catch "FM skips." Please tell me what conditions produce these effects so that I can know when to look for them.—Alan A. Durrenberger, Fort Walton Beach, Florida

A. "FM skips" are not heard at all times. They are the result of atmospheric phenomena.

When listening to shortwave signals, it is often possible to hear signals which are a long distance from the receiving site. A listener who is much closer to the transmitter might not even hear this same signal; it has *skipped* over the closer receiving antenna. For this reason we often refer to distant-signal reception as "skip reception." FM reception is considered to be limited by the horizon. Often, signals transmitted from much greater distances than the horizon can be heard, but these signals can be heard at all points between the transmitter and the most distant receiver, with no skipping. Despite all of this, it does appear that the term "skip" is becoming synonymous with the reception of any distant station, whether or not it has skipped over some receiving sites.

Foggy conditions up and down the coast and/or temperature inversions provide opportunities to look for "skip" stations.

If a meteor shower is likely, try to listen for distant FM signals then. Reception will be erratic. Identification of stations and their locations can be difficult.

Magnetic storms and auroras can cause an increase of distant-signal reception on the FM band, but not in all latitudes. Such reception is not likely in your area. It is likely in extreme northern and southern latitudes.

Look for weather fronts. The time just before the passage of a front is often good for the reception of distant signals.

Spring and fall months are best for such reception because the greatest temperature contrasts are present. These contrasts cause the greatest changes in atmospheric density. As we learned in high school physics, different densities result in diffraction of light rays. Exactly the same thing happens when radio

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See son... there really is a 4-channel 8-track record/playback deck!

Perhaps that surprises you, son. But it's true.

You see, there's been a lot of excitement lately about 4-channel stereo. And, like most people, you probably thought that all 4-channel recorders are open-reel.

Well, AKAI will change your mind.

You'll discover a whole new world of 4-channel recording when you see—and hear—AKAI's exciting new CR-80D-SS... a remarkably engineered 8-track 4-channel/2-channel compatible record/playback deck.

The CR-80D-SS is compact... easy to operate. And conveniently placed front-panel controls make professional 4-channel discrete recording a breeze.

Which means that you'll be able to make your own 4-channel tapes. And also enjoy the increasing availability of pre-recorded 8-track 4-channel music.

What's more, the CR-80D-SS is equipped with professional features such as Automatic Stop/Continuous Play... Fast Forward... Automatic 4/2-channel Stereo Selector... Illuminated Program Selector... 4 VU Meters... front panel 4-channel headphone outputs... and much more.

So don't assume that all 4-channel recorders are alike. They're not, my son.

See your AKAI dealer. He'll give you a new outlook.

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signals (of high enough frequency) pass through atmospheric layers having different densities. This signal diffraction causes the signals to follow the curvature of the earth rather than being radiated out into space as would otherwise be the case.

There is always a certain amount of this diffraction, caused by dust particles and by random fluctuation in atmospheric density.

To take advantage of these minute opportunities, however, you need a high-gain receiver, as well as a high-gain receiving antenna. You must aim such an antenna carefully, both in terms of azimuth and in terms of elevation. This requirement calls for two rotators, one for conventional azimuthal alignment, and the other for elevation adjustments.

Unlike AM signals, distant FM signals can often be heard during daylight hours. Do not miss them by failing to check on reception during appropriate weather times during daylight hours.

Hum in a Receiver

Q. I have become aware of a problem in my receiver that may have existed for a long time before I noticed, but since that moment it is harder and harder to live with.

There is a slight hum in the speakers of both channels (also present with headphones), that persists regardless of input selected, volume, and which way the balance control is set. It has nothing, either, to do with tone controls which can be switched out entirely.

I took the unit to the local service shop. They tell me that the equipment conforms to specifications. It has not, however, improved since that wasted visit. I suspected the power supply or a problem with grounding.

Because it is next to impossible to hear the humming (which can get on your nerves if you can hear it) in a noisy showroom, the service people probably did not notice that there is any problem at all.

Will I be stuck until servicemen make house calls, or is there something I can do for myself?—Steven L. Meyers, Buffalo, New York

A. Generally speaking, the earlier stages of a receiver have more filtering than the later stages because of the need to isolate these early stages from common coupling situations which would otherwise be present. Thus, even when the main filtering of a power supply begins to fail, hum is present only in the later stages—those stages which come later on in the chain than tone and volume controls. Therefore, the amount of hum is not influenced by the setting of these controls.

An efficient speaker also adds to the difficulty. Your service shop might not have used efficient speakers. Hence, hum would not have been audible.

There is a hum and noise specification for most pieces of equipment. One such specification measures hum and noise with the volume completely turned down. When your equipment was checked, the technician might actually have performed this measurement rather than an aural test, and, if so, it could be that the equipment has some inherent, audible hum, at least with your speakers.

The replacement of power supply filter capacitors should eliminate the hum, assuming that the problem is not inherent in the design of the equipment.

If you have a problem or question on audio, write to Mr. Joseph Giovanelli, at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped self-addressed envelope.

"Hey...what do you want for under $100?"

If you're looking for the best combination of features, performance and value . . . look no further. Glenburn delivers just that.

The features . . .

- Tone arm damping in manual and automatic modes . . . up and down
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- Automatic tone arm lock
- Cartridge and dust cover and base standard . . . Nothing else to buy.

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All these unsurpassed features and improved performance available in four great new automatic turntables . . . All priced under $100. Prove it to yourself. At your nearest Glenburn Dealer. He'll help you choose a Glenburn automatic turntable to fit your needs as well as your pocketbook.

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All models have complete internal protection. IM distortion is better than 0.05% from 0.01 watt to full power. All units mount in a 19-inch rack. Three year warranties cover parts, labor and round-trip shipping.

DC300A

delivers 150 watts RMS per channel into 8 ohms, or 600 watts output in monaural operation; height 7 inches.

D150

delivers 75 watts RMS per channel into 8 ohms; height 5¼ inches.

D60

delivers 30 watts RMS per channel into 8 ohms; height 1¾ inches.

Reliable performance and superior audio quality give you years more valuable service, making that higher original investment a real bargain. Every piece of equipment is ruggedly constructed, rigorously tested and guaranteed to meet or exceed printed specifications. All circuits are outstanding for low noise and distortion, wide bandwidth and high frequency response. It's to your credit when you specify the manufacturer with 26 years experience in broadcast and professional studio equipment.

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Model IMA tests audio equipment easily, quickly and accurately. Both intermodulation distortion analyzer and internal oscillators are enclosed in one compact unit. Even an inexperienced technician can take ten power level measurements in 5dB steps in just 60 seconds. The ranges are 100, 30, 10, 3, 1, 0.3, and 0.1%.

MAGNETIC TAPE EQUIPMENT.....*IN THE PRODUCTION STUDIO*

All models are designed to work 18 hours a day, 7 days a week for 10 years with three head replacements. Modular construction and plug-in circuit boards mean fast, easy field servicing. These precision instruments will make clean, accurate recordings years after the economical semi-pro decks are retired. All models handle ¼-inch tape and 7-inch and 10½-inch reels. All mount in 19-inch racks. Standard speeds are 15, 7½ and 3¾ ips. There are individual record, erase and play heads for 1 to 4 channels. Over 40 standard models are available with numerous professional accessories.

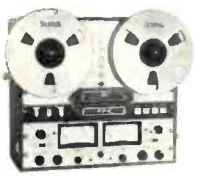
CX822 Mastering Recorder
computer logic control for safe, rapid tape handling and editing ■ full remote control optional ■ TracSync available ■ each channel has two mixing inputs and individual bias adjust and equalizers ■ third-head monitor for meters or headphones with A/B switch

...*IN THE CONTROL ROOM*

SP722 Studio Player
simple tape transport system has only 9 moving parts ■ remote start/stop optional, automatic stop in play mode

...*ON LOCATION*

SX822 Recorder/Mixer
integral mixing facility simplifies setup ■ same tape transport system and meter monitoring as CX822 ■ two mic or line inputs per channel



ES224

STUDIO TRANSDUCERS

Four models of superior quality speaker systems have advanced-design electrostatic elements for midrange and treble and acoustic suspension base woofers, for finest possible reproduction for the professional recording studio. Two models of excellent cone speakers provide fine sound for broadcast monitoring.

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Tape Guide

Herman Burstein

Recording Current

Q. I have two tape recorders with a common problem. Although they are different brands, the circuit problem is common to both. I use the same kind of tape on both machines. I find that when I have the record bias adjusted properly (-1 db from the peak) I have more playback volume than I should have. I think the audio current to the record head is too high. Can this be lowered without any sacrifice of audio quality?—John C. Frank, Santa Ana, California

A. Unless you are getting noticeable distortion, the recording current to the record head is not too high. If you reduce the amount of audio current to this head while the meter reads 0 VU, you will reduce the signal-to-noise ratio, which of course is undesirable. In the event that distortion is noticeable at the 0 VU level, you can either reduce the signal to the record head, or else change the calibration of your VU meter, thereby getting a 0 VU indication at a lower and proper recording level. There may be an adjustment in your tape deck which will cause the VU meter to give a lower reading for a given playback signal. If the VU meter reading in playback is a function of the setting of the playback gain control, you merely have to adjust this control to avoid over-driving the meter.

Indexing Tapes

Q. (1) I find it quite frustrating to attempt to locate selections, usually classical, on tapes indexed for one machine and played on another, since invariably the indexing for the two machines (of different makes) is not the same. I wonder if it might not be more practical to place some sort of indexing marks on the back of the tape which would aid in visual location of a selection while fast winding the tape. The question is what substance would be durable, non-damaging, etc. (2) Is it true that bulk erasing a new or reused tape prior to recording will result in a higher signal-to-noise ratio? My question is prompted by a desire to determine if it is worth investing in a bulk eraser. —C. J. Hill, San Francisco, California

A. (1) I would strongly advise against pasting any substance onto the tape for the purpose of indexing, for this may cause the tape to stick in going through the system of guides, rollers, etc. More appropriate would be to intersplice your tape with leadertape, which is available in various colors if you wish.

(2) Bulk erasers can do a more effective job than the erase head of a tape machine. If a tape has been heavily over-recorded, the erase head may not be able to remove all the signal, and a bulk eraser is then recommended. It is claimed that a bulk eraser can lower the noise level of a virgin tape. However, this advantage is usually lost when the tape goes past the erase head, according to one correspondent, who claims that the erase head imposes some noise on the tape. This correspondent states that he has therefore deactivated the erase head of his machine (check the bias going through the record head if you deactivate the erase head).

Speed Change With Age

Q. I have had the following experience with medium-priced Roberts tape recorders (770, 1630, 770X, etc.): increasing wow and flutter as the machine is used, starting noticeably after about 150 hours of use and getting awful after about 600 hours of use. Does anyone know the cure for this?—Robert Colvin, Hayward, Calif.

A. Possibly the wow and flutter of which you complain may be due to accumulations of dirt, grease, etc. on the capstan. A thorough cleaning of the capstan and other parts contacted by the tape may help.

Treble Peak

Q. I have an Ampex 1455A. Everything about it is excellent except the 7½ ips frequency response. Using Scotch 203 tape, setting the bias at one point gives a flat record-playback response at 3¾ ips to 10 kHz, down 2 db at 12 kHz. However, at 7½ ips there is a peak from 3 kHz to 10 kHz of more than 5 dB. Setting the bias at 7½ ips will not lower this peak below 3 dB at 8 kHz without totally wiping out anything above 12 kHz. In short, the 3¾ ips record-playback response is smoother than that at 7½ ips. The record equalization appears to be the same at both speeds, while one resistance is changed during playback. Is there any modification I can make to the equalization to correct the 7½ ips response?—W. Craig Chambers, Rantoul, Illinois

A. Use of low-noise tape requires both an increase in bias and a decrease in high-frequency record equalization. The additional bias is about 15%. The cut in treble is about 3 dB at 15,000 Hz. I would guess that you have been increasing bias too much in the attempt to remove the treble peak. As you recognize, a change is also needed in the record equalization. I cannot give you specifics as to what changes to make in your equalization circuit. This is a matter for the manufacturer, and I strongly advise you to consult him.

Demagnetizing Heads

Q. An article I read on tape recorder maintenance has raised some doubts in my mind as to whether I've been following the correct procedure in demagnetizing the heads of my recorder. According to the article, it is important to turn on the demagnetizer when it is about two feet or so from the heads, then slowly advance it toward the heads and proceed to demagnetize in the usual manner. Up to now, I've always started with the pole pieces next to the heads, and have heard no audible ill-effects. Assuming the recorder itself is turned off beforehand, is any harm likely to result to the heads or the recorder itself by switching the demagnetizer on when it is in close proximity to the recorder?—Stephen Sarper, Pittsburgh, Pennsylvania

A. Instructions and procedures usually try to provide a healthy safety margin. It is safer to turn on the head demagnetizer while it is a good distance away from the heads than when it is close to them. Whether the recorder is off or on does not matter. If you turn on the demagnetizer while it is next to the heads, this may magnetize them to an extent that they cannot be demagnetized—at least not by a head demagnetizer with a relatively weak field.

Loop Connection Recording

Q. My question concerns a kind of "loop" connection of my two TEAC

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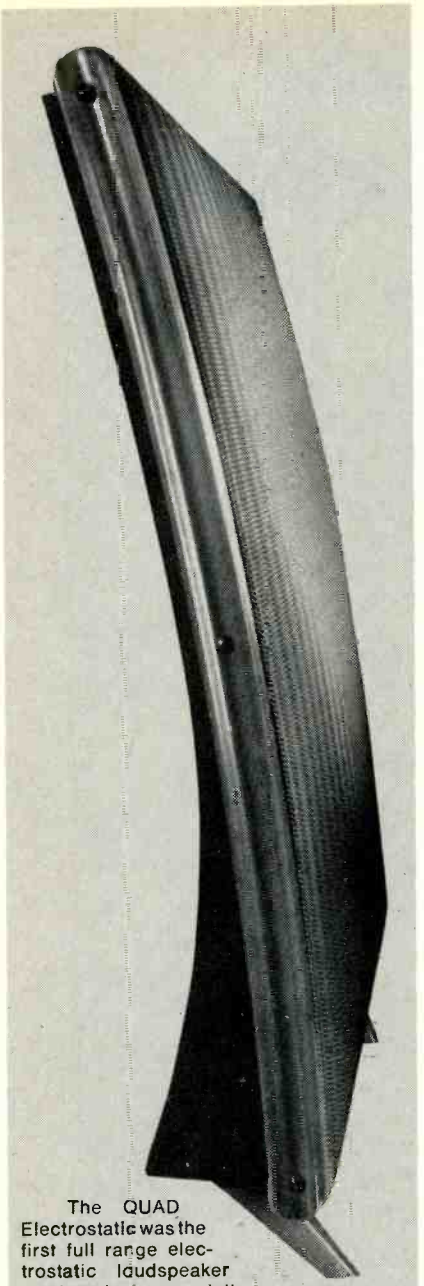

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A4010S tape decks. I have occasionally made two tape copies of old discs at the same time, by connecting the tape output from the preamp to the first tape deck, the output of the first tape deck to the line-in on the second tape deck, and the output of the second tape deck back into the input jack on the preamp. This setup seems to work quite well, but I have noticed on occasion a loss of high frequencies in the product of the second tape deck. I clean and demagnetize my tape heads once each week, so I am quite sure this is not the problem. Would there be a possible further loss of fidelity if a third tape deck is used in the same loop?—Ronald Burnett, APO San Francisco

A. Have you tried reversing the sequence of the two tape machines in your loop? If the output of formerly your "second" deck (and now your "first" deck) has adequate high frequency response, the fault would not appear to be in this deck. Rather, the fault would appear to be in the cumulative effect of a slight treble loss in each machine.

High quality tape machines, in order to obtain an optimum combination of low noise, low distortion, and good treble response, typically are down 2 to 4 db at 15,000 Hz at 7½ ips. This is consistent with industry standards. While such a drop tends to be inaudible if one goes through only one step of recording and playback, it becomes audible when one goes through two steps, as you do in your loop. Introducing a third machine into the loop would increase the problem.

Bias Requirements

Q. (1) I have many tapes recorded at 3¾ ips, and occasionally have to dub parts of one reel onto another, connecting the line out directly to the line in jacks of the tape recorders. This works OK, but of course it works twice as fast if the speed of both recorders is set at 7½ ips. My question is, if I use the 7½ ips speed, at which speed should I set the bias on the recorders? (2) When using a good brand of low-noise tape, what is about the average range of recording in dB from distortion on the top end to noise on the bottom end? Some program material ranges from sounds so low that the VU meters won't register to crescendos that peg the meters. (3) If one's machine is biased for low-noise tape, what is the result of using the so-called standard tape?—L.N. Norman, Winthrop, Iowa

A. (1) Set the bias at 7½ ips. Keep in mind that if you play and record at double the speed, all frequencies are doubled. This means that the electronics of your tape machines have to handle frequencies to about 30,000 Hz. Also, to avoid the possibility of beat frequencies between the oscillator frequency and the audio frequencies, the oscillator frequency of your recording machine should be about five times the highest audio frequency—about 150,000 Hz.

(2) Good tape has a dynamic range of something like 65 dB.

(3) Low-noise tape requires more bias than conventional tape. If conventional tape is used on a machine adjusted for low-noise tape, a fall-off in treble response may be expected. This is made worse by the fact that a machine adjusted for low-noise tape employs less treble boost in recording than one set for regular tape.

Mono and Stereo Playback

Q. I am contemplating the purchase of two cassette recorders, specifically the Sony Model TC-100A and the Crown Model CSC 9350 M. The former is monaural, and the latter is a stereo recorder. The Sony recorder is to be used for voice type letter recordings made on the Crown recorder, and vice versa. I am told that because of the two different type heads (one stereo and the other mono), that playback may not be possible. It is this point that I am unfamiliar with and would appreciate your comments on.—Jose F. Reyes, APO San Francisco

A. If the Sony (mono) machine has quarter-track heads (permitting four tracks to be recorded), then you should be able to interchange recordings made on the Sony and Crown machines. That is, a recording on either can be successfully played back on the other. If the Sony has half-track heads, then there is a problem of compatibility. A recording made on the Sony can be played back on the Crown (although with some loss of signal-to-noise ratio, because the quarter-track head of the Crown does not cover all the track recorded by the Sony). However, a recording made on the Crown cannot be played back on the Sony, unless you avoid recording on tracks 2 and 3 (the middle tracks). The reason is that the half-track head of the Sony will span more than one of the quarter-tracks of the Crown.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped, self-addressed envelope.

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3M Cartridge Decks

Dolbyized models 8075 (2-channel record/playback) and 8080 (2-channel record/4-channel playback) were demonstrated at the Winter CE Show in Chicago. The units were designed specifically for use with the new 3M ferric oxide tape, said to boost frequency response to the 15,000 Hz range. Each deck has a selector switch enabling it to record or play either standard or the new 3M tape. The Dolby circuits function in both recording and playback modes and in conjunction with Dolbyized FM broadcasts. Signal-to-noise ratio is said to be increased 10 dB at 4,000 Hz and above. Model 8075 features a minutes-and-seconds timer, fast forward mode and a special cueing system to assure that the tape is always at the beginning when the unit is placed in the record mode. Model 8080 has a digital minutes-and-seconds counter and, in addition to recording and reproducing stereo, plays pre-recorded 4-channel tapes. Model 8075: $299.95; Model 8080: $344.95.

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The Model Nine 3-way column features four 4½-in. extended range drivers, an 8-in. passive radiator and a piezoelectric high frequency unit in a controlled dispersion array. This arrangement is said to provide primarily direct radiation of the upper frequencies, progressing gradually to primarily indirect radiation for the lower and lower-mid frequencies. The piezoelectric principle eliminates the magnet and voicecoil of conventional dynamic designs and replaces them with a ceramic crystal element which eliminates the need for a crossover network. The speaker can be driven by as little as six watts (rms) per channel or as much as 100 watts/channel without damage. The unit measures 9 in. x 10½ in. x 33½ in. high and is priced at $165.00.

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Nortronics Booklet

Next time you visit your Nortronics dealer, pick up his free Form #7334. The brochure contains details on the company's line of test and alignment tapes for cassette, 8-track cartridge, reel-to-reel, and broadcast spot announcer recorders. Discussed are: the need for and use of test tapes, detailed info on Nortronics' comprehensive line of tapes, and a brief section describing the QM-Series Recorder Care Products.

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Editor's Review

ONE OF THE MOST interesting chores one assumes when taking over the editor's chair at a magazine such as AUDIO is reviewing, or assigning for review, the various publications which are sent in. These range from the catalogs of the different manufacturers and sales organizations, through the latest transistor substitution handbooks, to the regularly appearing and, I must add, much needed guidebooks for the novice (needed to keep them from achieving listings in the *Guinness Book of Records* under acoustic feedback and ground-loop hum). Items falling into the first category generally are quickly placed in the proper hanging file in one of four file cabinets. Those in the last two categories often will receive a short write-up, which eventually appears in the "What's New in Audio" column, and then the book is placed in the proper area of AUDIO's small library.

Now and again, we will receive a volume which will deserve a considerably more complete discussion. Two of these have come in recent months, and I would be remiss in my duties were I not to share them with you.

The first is *ACOUSTICS: Historical and Philosophical Development*, a collection of 39 articles, some of which have been translated into English from the French, German or Latin for the first time. R. Bruce Lindsay, of Brown Univ., is the editor of the volume and of the series to which it belongs, Benchmark Papers in Acoustics, which is being published by Dowden, Hutchinson & Ross, Inc., Stroudsburg, Penna. 18360. Price of the 480-page book is $24.00, and it is distributed outside the U.S. and Canada by John Wiley and Sons, Inc., 605 Third Ave., New York, N.Y. 10016.

Lindsay opens the book with a short introduction, entitled "Acoustics: Science, Technology, and Art," which is then followed by Lindsay's account of the "historical progress of the science of acoustics," which appeared in the April 1966 issue of the *Journal of the Acoustical Society of America*, of which Lindsay is Editor-In-Chief. The other papers in the book, from Aristotle's *De Anima* and *De Audibilibus* through Sabine's "Reverberation," are presented in chronological order and include selections by Galileo, Boyle, Newton, Helmholtz, and Lord Raleigh.

To say the very least, this volume should be considered a "must" for most everyone seriously concerned with acoustics. It is intended by the editor "to serve as an introduction to the series as a whole, in that it emphasizes through its 39 articles the historical and philosophical growth of the whole subject from very early times up to approximately 1900." To my lights, it accomplishes this purpose very well. About the only criticism I have, something which others may like, is that the type used to print most of the articles has been photocopied from early editions of the various works. While in my opinion, this makes for difficult reading, others might well reply that it helps give the reader the flavor of the time.

Two other volumes in the Benchmark series have been published: *Underwater Sound* edited by Vernon Albers and *Speech Synthesis* edited by J. L. Flanagan and L. R. Rabiner. Some 10 other volumes have been announced, including *Physical Acoustics* edited by Mr. Lindsay, *Psychological Acoustics* edited by Arnold Small, *Physiological Acoustics* edited by Small and Joel S. Wernick, and *Acoustical Instrumentation* edited by Benjamin Bauer.

The second book which I would like to commend to your attention may appear somewhat more prosaic since it is a dictionary, but, oh, what a dictionary. It's the *IEEE Standard Dictionary of Electrical and Electronics Terms*, and it contains more than 13,000 definitions, which are the official standards of the IEEE. As the flyleaf notes, the work is the product of decades of labor and contains hundreds of new terms as well as revisions of earlier ones.

The definitions are arranged in standard alphabetical fashion and are supplemented with data on preferred usage, variations in meaning among specialties, cross-indexing to related words, and code numbers which identify the source of definition and the field in which it originated. The *Dictionary*, which has been approved by the ANSI, is available through John Wiley & Son's Wiley-Interscience division or the IEEE.

Boston Section for AES

Formed last Fall, the Audio Engineering Society's Boston Section will have its next regular monthly meeting on Wednesday, February 27th. Scheduled speaker is Richard Burwen, who is to demonstrate his noise-reduction system for discs if preliminary work can be completed in time. For further information on the meeting or on how to join the Society, call or write Joe Hostetter, Chairman of the Section, at 39 Bay State Road, No. 2-R, Boston, Mass. 02115 (617) 262-6965 or Paul Moverman, 225 Merrymount Dr., Warwick, R.I. 02888 (401) 463-7272. *E.P.*

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Behind The Scenes

Bert Whyte

TEN YEARS AGO Phillips of Holland introduced what they called the "compact cassette." In essence it was a miniature reel-to-reel tape system enclosed in a handy-sized plastic cassette. With a tape width of less than an eighth of an inch, and operating at a snail-paced 1⅞ ips, the frequency response and signal-to-noise ratio were quite restricted, but deemed adequate for its intended purpose . . . that of a convenient format for dictation and sonic "note-taking." Incorporated into pocket-sized battery-operated portable recorders, the cassette system soon caught the fancy of millions of people.

As with any tape recording system, it was inevitable that the cassette would inspire experimentation as to its feasibility as a storage medium for music. In spite of the pitiful quality of those early monophonic recordings, it was obvious that quite a few people felt that the cassette had great potential as a vehicle for commercially produced recordings. A great deal of money, time and technology was lavished on the cassette to make it a viable music playback system, and the rest is history . . .

Today, the devotee of cassettes has a highly sophisticated system at his disposal. There are hundreds of models of cassette recorders, and from $150 units on up to $1100, Dolby B-Type noise reduction is virtually standard. Even the modestly-priced recorders have quite respectable motion performance. Blank cassettes come in a wide variety of configurations, replete with exotic ferric oxide formulations as well as chromium dioxide coatings.

Along with solid state electronics, these features have the cumulative effect of making cassette recorders available that have a 30 Hz to 15 kHz frequency response along with signal-to-noise ratios on the order of 58/60 dB. The owners of these cassette recorders have a voracious appetite for blank cassettes, whose sales keep skyrocketing higher every year.

As for commercially recorded music cassettes, there are thousands from which to choose covering every aspect of music. For quite a period it was a common practice of the record companies to have simultaneous releases of the same productions on disc and on cassette. The cassette world looked rosy indeed and, as you might expect, some of the rabidly enthusiastic cassette boosters and any number of pundits were claiming that the high fidelity quality of the cassette was as good as the phonograph record, and maybe even as good as open reel tape. Once again we were assured, the demise of the disc was at hand. However, in the midst of all this euphoria, you will note that I made my comment on the simultaneous disc/cassette release policy of the record companies in the *past tense*. And there, friends, hangs a tale . . .

In this cold winter of our energy crisis discontent, the situation anent the release of recorded cassettes can only be described as bleak. The number of new cassette releases each month has been reduced to a trickle. RCA, for example, issues cassettes on a "selective" basis now, with only those productions they consider of "hit" status as candidates for the cassette format. Truth is, months have gone by without any RCA cassette releases. Ampex Stereo Tapes, once the fountainhead for a veritable torrent of recorded cassettes, is also operating on a "selective" basis. Of course, they represent so many different record companies, that even with this restriction, a fair amount of cassettes are released each month. Reduced output of cassettes is the order of the day with most record companies, with Columbia apparently the only record company maintaining its output at or near the levels of the past several years. To put this whole business of recorded cassette releases in the most candid perspective, let me say that it is fairly common knowledge within the industry that a number of companies would like to get out of the cassette business altogether.

The decline of the recorded music cassette is due to a number of factors. From the record companies viewpoint, it is simply a question of ever diminishing sales. Why are cassette sales down? To put it succinctly, and rather bluntly I'm afraid, the cassette at its present technological level cannot compete with the sound quality of the phonograph record. A strong statement this, and I can see the hackles rising on the necks of the cassette contingent. But examined dispassionately, in a direct cassette/disc comparison, the ear validates the quality differentials which tips the balance in favor of the disc. Before going into some of the problems encountered with recorded cassettes, let me state that I am not "anti-cassette," nor do I have any particular axe to grind for the phonograph disc. As far as I am concerned, the size, shape, speed or any other parameter of a music storage medium is entirely irrelevant. My one criterion is that the medium be capable of reproducing music with the highest possible fidelity.

I have been in Ray Dolby's laboratory in London where I watched him making Dolby B cassette copies from Dolby A-Type 15 ips master tapes. The cassette recorders he used were high quality units, but nonetheless were standard models available in any hi-fi shop. On direct A/B comparison between master tape and copy, it was difficult, if not impossible to detect any difference between them. I have done the same thing with my equipment at home. The important factor here is that Dr. Dolby and I were making copies at a one-to-one ratio. This essentially is what every cassette recorder user does when he engages in the common practice of recording "off-the-air," or copies phonograph records. With virtually any standard recorder, using correct level settings, it is quite easy to produce high quality recordings, which is why this form of activity is so popular, and why sales of blank cassettes keep rising.

Contrast this one-to-one recording, with the standard duplicating process used in producing recorded music cassettes. Naturally the dictates of economy call for higher speed multiples in commercial duplicating, with a ratio of 32 to 1 in general use. There are problems enough with this duping ratio, so one is aghast when stories circulate about the use of ratios as high as 128 to 1! The tiny width of the cassette tape operating at these speeds imposes severe guidance problems in the transport of the slave recorder and often gives rise to tape "skew," which can cause crosstalk. In fairness, it must be said that nowadays the guidance

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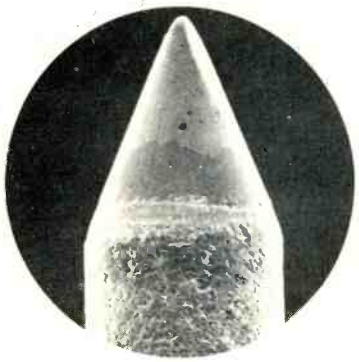

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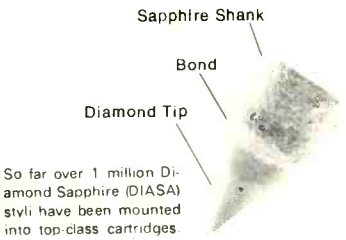

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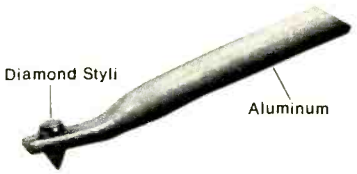

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problems are far fewer than they were several years ago.

The main problem with high speed cassette duplication is modulation noise. Modulation effects are caused by magnetic discontinuities. If the tape stock used for duplication has poor crystal structure, which cause the formation of dendrites (clumping particles and accretions which appear on the surface of the tape as protuberances), dropouts will occur. Although some of these dropouts would be detectable at the 1⅞ ips real-time speed of the consumer cassette recorder, at the 32 to 1 duping speed multiple dropouts are passing by the recording head. This causes the sound on the recorded cassette to have an undulating, wavering sort of characteristic. On many types of music this is not too noticeable; the ear simply is aware of a general lack of clarity in the sound. However, in any music where woodwinds such as flute, clarinet or oboe are in an exposed position, especially in solo passages, the instruments sound blurred and buzzy.

When a consumer plays back a recorded music cassette on a unit which is in optimum operating condition, he may encounter any or all of the following. The sound may wow and waver in a rather gross fashion, especially noticeable during sustained piano chords. This wow is not inherent in the unit, but can be the result of a poor wind in the cassette tape pack or a poor quality and insufficiently lubricated inner liner in the plastic cassette. On sections of the cassette, the sound may exhibit occasional distortion because in the process of duplication the tape overload limits have been exceeded and the magnetic particles have become saturated. As mentioned earlier, the most frequent flaw is the "burbling" sound of modulation noise. I should mention that for the most part there are no problems with the playback of Dolby B-Type cassettes, but there is the factor that because the Dolby process has reduced the tape hiss, this often makes the modulation noise more apparent.

It is all these noise and distortion problems, singly, or in combination, which have frustrated those people who have wanted to use recorded cassettes as a viable alternative to phonograph records. Of course, not all cassettes have these playback problems. Nor does everyone have the quality of associated playback equipment which is more revealing of these sonic flaws. Nonetheless, enough hi-fi enthusiasts are aware of the problems to account for the declining sales of recorded music cassettes.

Can anything be done to resolve these cassette problems? I should note here that the worst culprit, the modulation noise, is not a consequence of high speed duplicating ratios alone, but a combination of the speed and the quality of the tape oxide. As noted in these pages before, Advent Corp. is planning to issue recorded music cassettes which have been duplicated at a speed ratio of only 4 to 1 and use chromium dioxide tape. This approach is all right for a specialized "premium" product, but most engineers feel that this is not an economical idea for large scale duplication. Mr. M.B. Martin, an engineer for the Memorex Corp. writing in the November 1973 issue of the *Journal of the Audio Engineering Society* on cassette duplication, has some very interesting ideas. In essence, he feels that the modulation noise problem could be solved by the use of higher quality tape oxides, and he lists the various oxides and describes their properties. He acknowledges the generally superior characteristics of chromium dioxide, such as the almost perfect acicular particle which makes it free of dendrites, its higher coercivity, improved short wavelength (high frequency) performance. He also points out that chromium dioxide requires a much higher bias current for optimum recording, it is higher in cost than any other oxide, and there are special equalization criteria to be met. Understandably, Mr. Martin is keen on Memorex's new MRX-2 ferric oxide tape, and gives some very cogent reasons for its use in duplication. If what Mr. Martin says holds up in practice . . . and I'm inclined to think that it will . . . it would be a shame if the duplicators didn't try such a product. As Mr. Martin points out, the extra cost involved in using his oxide is on the order of 3 cents for a C-60 cassette, and a nickel for a C-90 cassette. If the better oxides, used at the same standard duping ratios, results in a cleaner, better-sounding cassette free of modulation noise, the record companies should make such a product available to the consumer, even if it had to be sold at a slight premium to offset higher costs.

I have an experimental Dolbyized chromium dioxide cassette recording of *La Traviata*, sent to me by Ampex Stereo Tapes, and some similar cassettes from BASF. Significantly, they are free of modulation noise, although they are not perfect in all sonic respects, i.e. some tape saturation. It is food for thought at least, and maybe some people will be interested in the resusitation of the recorded music cassette. AE

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Audio—ETC

Edward Tatnall Canby

Total Everything
I. End of an Era

Well, it really is the end of an Age, and the beginning of another. Who'd have believed it? These are days we will all remember. The old era of limitless bigger and better, the More and the Most, is a dead duck. Or rather a tired jalopy, clean out of gas.

We are going to have to convert our thinking and our acting to a new age, unaccustomed as we are, an age of economy and careful common sense. What an order, for *us*, the biggest free spenders on earth! We'll do it, though, and it won't do us a bit of harm. Far from it. Not even in audio. But it's going to take a lot of new ingenuity, applied in strange new ways. Not how can we make MORE and still more, but how can we make more with *less*. How do we get along with what we have, and not very much of that? Unthinkable, but healthy. Turn that thermostat down, buster.

Luckily for us, we still have the know-how. There is still plenty of that well-known Yankee horse sense around, the envy of much of the world, the ability to DO. It's the truth! Living in Europe awhile last summer, I could actually feel it and see it. To observe how other people can bog down into frustrating complexity, where we at home would sail blithely right on through, is to marvel that with all our problems we really are still the original big-time industrial country. It's not just money. It's thinking, acting. Thinking out a system and carrying it all the way through, making it work no matter how complex or big. Or small. We are so direct—we move so fast! We boil things to essentials in moments, we know how to function and to get on with it, we demand results, or else, and we get them or quit. If we must, we also know how to change, to backtrack like lightning, cut our losses, come out roaring in another direction. We are still uniquely *flexible*. Flexible, that is, when we have a mind to. We very seldom bog down into the unworkable in our enormous expanse of industry. Go man, or get out.

Trouble is we've been misapplying our talents. Now we get back to basics and use our leverage where it counts. Back to Ben Franklin, to Thomas Edison and Henry Ford! With all the modern trimmings. The last Frontier is gone, the Petroleum Frontier. Just try, young man, to Go West on petroleum. (Was it Horace Greeley said it?) Young man, if you do try that, you will not get from New York to Hoboken. As for the Nuclear Frontier, it isn't out of the ground yet and the idea of limitless energy that way is a pipe dream (but more power to it). So off to work, fellows and gals, to see what we can do with what we have. It'll be fun. Gruelling fun.

* * *

On my work desk, for instance, sit two file boxes in which for years I've dumped the detritus a writer always files under his ABC. One file is made of ordinary office metal, finished a dull gray. Undistinguished. The other, identical in size and operation, taking the same hanging file folders, is made of wood, a rather elegant veneer. I like it. That box was a product of WW II. No metal! So they converted to wood, and did better than ever. Good job.

Then, back in my closet, there is a pile of old ETs, electrical transcriptions, big shiny lacquer discs professionally cut for studio and off-the-air recordings in the days before tape. Most are of me, so I could find out how I sounded. (I sounded awful.) Nothing special about these oldies, the big 16-inchers and the 12-inch 78s (so I could play them at home). The usual aluminum base blanks, cut with good-looking grooves (wish they sounded that good). But a half dozen or so are different. On the envelope is a big red label. *GLASS*. These, too, date from the depths of WW II. No metal. So they converted the ET to glass, and went right on recording. Some of those glass discs sound better than the metal-base discs that came after the war. Hold the disc up to the light and you can see right through the lacquer, a deep purple red. That was some breakthrough, if I may coin a breakable pun. It's the kind of thing we will be doing *these* days.

You know, it is quite possible that *we* may some day convert to glass discs. More in a few moments. Materials like that are the things we will now keep our beady little eyes upon, just in case. It's a material that we *have*, and it isn't petroleum based. Suddenly, things like that are important. They should be. As for wood, you can never tell when that ancient, reliable and renewable raw material is going to turn out to be the best thing for a job. Hey, you kids, did you know we once used wooden phonograph styli? I tried them. The "needle" wasn't even round; it was square. You had a cutter-slicer gadget and you sliced off a new edge for every record side, if you had the patience. Built-in automatic noise filter, around 3 kHz and nothing higher. You couldn't possibly chip the shellac record, even if you tried.

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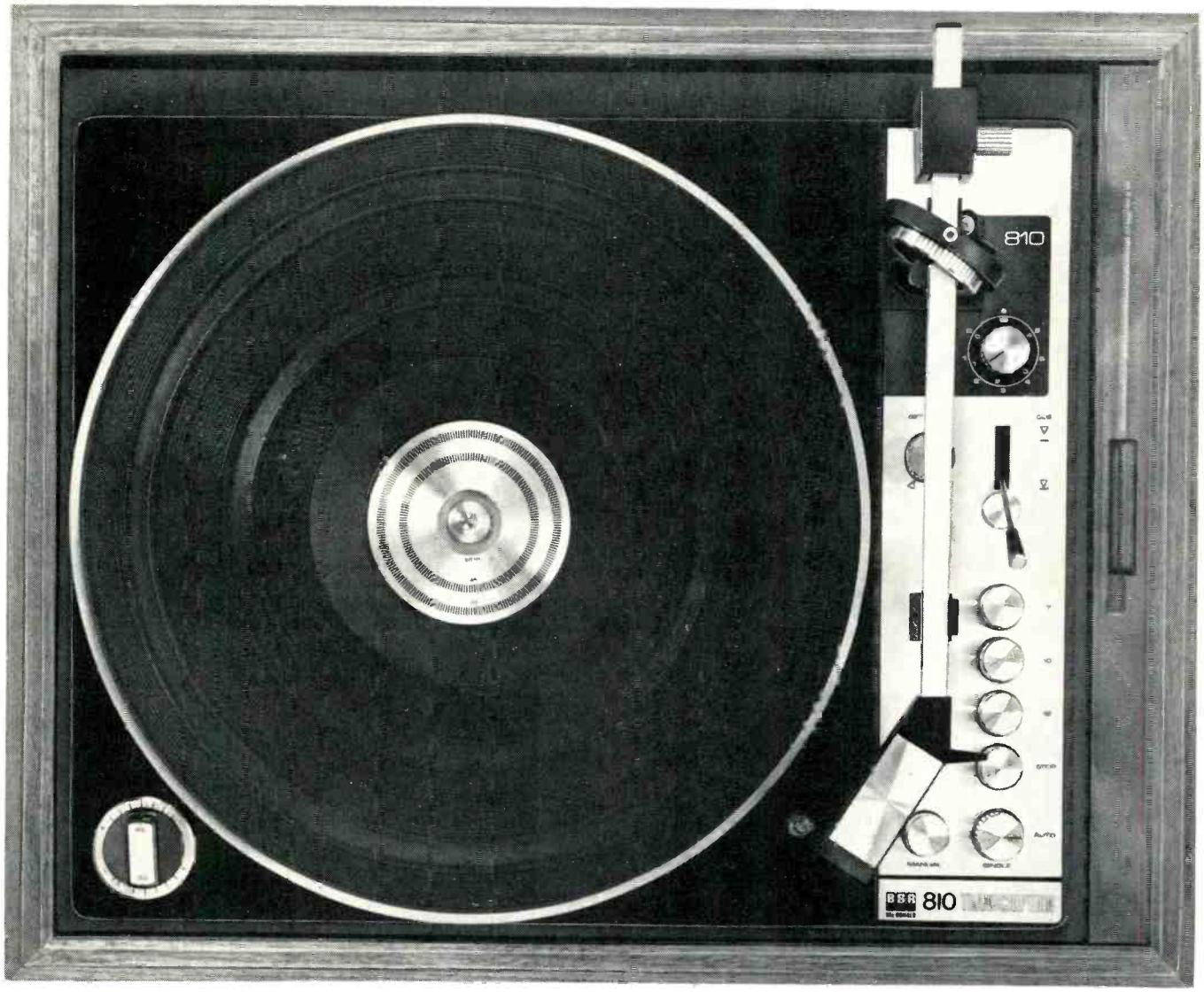

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So the new age is here, and I am glad. I am fascinated with the possibilities for us Americans, once we really accept the economical sanity that is about to break upon us. Just look back—we're already that far away—on the dizzy, zany age that is now gone. An era, you know, is often better reflected by its words, what it says, than what it does. For years I've been writing down the Bigger-and Better dillies that I overhear, in conversations, off the air, just so I can remember them and so that posterity, some of it, may read and marvel.

Take my favorite grammatical nonsense out of that age, all too familiar, what I call the Dangling Comparison. (That idea comes from the dangling participle of our English classes: "Taking off his shoes, they went swimming.") It is, rather, a limitless non-comparison, hanging tantalizingly, unfulfilled, absolutely meaningless (but oh—so persuasive). Part of our general madness in these last fine years! The Dangling Comparison is useful, all right. "Krispie Krunch give you MORE." More what? They never say. More everything, anything. Sounds so good. Ginger ale is better. Oh yeah? Gasoline is faster. And liquor is quicker. You get the idea. How could you help it? Listen to this genuine one, taken off the air in the very middle of Bigger and Better, Hallowe'en eve, Oct. 31, 1965. A new FM station in the New York region. It described itself thus: "This is station XXXX-FM—where more New Yorkers listen to the most, in stereo."

Well, I'm a more New Yorker, all right. As a New Yorker, after all, I *must* be more. But have I ever listened to the most? That's a question. I can do you better, with the quote that is the title of this piece. It was real. On June 6th of 1966, I rushed to my typewriter to get down this succinct dilly of a commercial message. It sums up the whole crazy, wonderful age we are now leaving. *"Enjoy Total Everything—All Day!"* End of message. End of era.

* * *

Will our present sh---ges (don't say that word!) mean, shortly, that fewer New Yorkers will be listening to the least, in mono? I doubt it. I think that we may even be able to enjoy Total Everything, if we are really careful. All day, too. But it's going to take every bit of our traditional ingenuity, swung over to a new viewpoint, a new game plan. I expect, then, that I will be into a lot of the facets of our own audio area these next months, as seen along such stimulating and challenging new lines. I'm not bearish. I just believe in keeping the eyes open, the better to see ahead. The power of positive thinking, yes?

2. Noise

Look briefly at audio noise. It's a big thing, these days. It'll get to be an even bigger thing, I suspect, as those sh---ages (don't mention them!) ease their way into our taken-for-granted quality standards. Noise in sound reproduction is maybe the first thing to be affected by our, er, changed circumstances. It isn't yet. I'm just looking confidently ahead.

Confidently, because of the wealth of superb thinking and engineering that has gone into noise reduction in these last few years. There's Dolby, and JVC, and in another general category, DBX and Burwen, and the Editor can probably add a dozen more right here. Whatever the brand, the fact is that most of these systems have been primarily occupied with the fruitful area of tape. The tape makers, too, hand in hand with noise reduction electronics. Lovely cooperation, from two vantage points, the tape itself and the selective suppression of unwanted residual noise. But noise reduction must go where the noise is. Noise is where there exists an imperfect medium—tape, for instance. But noise, too—do not forget—is when deterioration sets in. And where will that be but on *disc*. That is where my mind is roaming right now.

In WW II, you may remember, our supply of shellac for discs was inconveniently cut off by the Enemy, who took over and wouldn't send us any. Plastics? They went to war, but weren't advanced to the point of usefulness in 78s. So what did ingenuity do? For lack of any other solution, we suddenly found ourselves turning in an old shellac record for every new one we bought. Round and round! Reprocessing. (Where have I heard that term before?) This Spartan approach kept the record biz more or less alive for a number of crucial years. I wouldn't say it thrived. It existed. We had new records. Of course the quality, never any too good in terms of noise, went from awful to subliminal and horrendous. Better horrendous noise, we thought, noise and music 50/50, than no music at all. So we bought records, and we played records, on the recirculating basis.

We could do a lot better now. It might come to pass, I'd say, that one of these days we will start recirculating our present wad of vinyl. It would save untold tons of petroleum. That's enough to make us think twice, and stay one step ahead of the allocations. If this were to happen, the first big challenge would land on the reprocessors, to make old vinyl sound like new. We are good at things like that. But we start off, in this case, with near-total silence on our present discs, whereas shellac's loud old hiss covered a multitude of sins. With our best efforts, recycled vinyl noise levels would creep up only slowly, quite slowly. Heroic efforts to minimize the effect.

The reprocessors would soon have allies. A second approach is the use of noise reduction circuits. If our present noise reducers were to adapt themselves from tape towards disc, we could have new means to combat possible sonic deterioration. Between the reprocessors and the noise circuit people, I think we could do some amazing things, to Preserve Our Natural Resources *and* keep the disc alive. Dolby, of course, has already spread out into other areas than tape: optical film tracks, FM stereo broadcasts. I was interested to find that DBX now has a disc noise reduction system, the whole two-step bit, code and decode, with special discs cut to the DBX characteristic and a decoding box to play them through. Total silence! (But there weren't any ticks to suppress.) No distortion that I could hear, on a once-through audition. I forgot to ask whether the discs could also be cut with SQ or CD-4 modulations. This system and/or others of a like nature could take care of a lot of problems, if and when. They just might have to.

But I doubt if present noise circuitry is the whole answer. Those ticks and pops, the violently on-off transients of vinyl noise, are very different from the less jagged noise you generally find on tape, which is what the present circuitry removes. The human ear is fiendishly sensitive to very tiny transients, the jagged kind, set against a silent background. You can hear a swarm of tiny ticks on vinyl that will scarcely register in a laboratory measurement.

Think back again to another time, when the great flood of LPs burst out in the early 1950s after the changeover from 78. It was the noisiest flood you ever heard, a billion ticks and pops a minute, and we just plain got used to it. Didn't even listen. That's one way out but it's not the best. Then came vinyl improvements, pressing improvements, and lo—there were only a thousand ticks a minute, then a hundred. Fantastic. The first Dolby tapes brought us, finally, the first tick-free discs, their clarity at last revealed. Well, maybe not free. But nowadays you can play a record for a minute and not hear a single tick. Maybe three or four on a side is par for the course in good records right now. Down on the micro-scale of the stylus

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tip, though, it doesn't take micro-much to set off a very loud noise. Our present standards are almost too high to last.

Somehow, then, the noise reduction circuits, one-step direct and/or two-step code-decode, must begin to rethink themselves in terms of this thorny disc noise pollution, even before we have it, if we ever do. A rough challenge. It might be important. I would think that the immensely sophisticated computer-speed actions in this advanced type of circuitry might be able to do a lot for those swarms of ticks and pops. (If anybody needs samples, I have thousands from the 1950s.) If not to eliminate them, then to reduce them to genteel unobstrusiveness.

Maybe they can round off the jags, convert those vicious little sonic cliffs and gorges into smooth little hills, up and down as gently as you please. Like the live-audience concert coughs that get edited into gentle swishes. Maybe they could average the little hills down to a gray noise—and then simply remove the noise? Double action. I just can't wait for the pops and ticks to begin.

Oh yes—the glass disc. Just a rumor I heard, but I suspect it's out there. Of course, we have all sorts of discs waiting in the wings. Most of them involve far-out conversion, like the "TV discs," and so are impractical for the moment, at least in a big way. A glass disc is something else. Play anywhere.

The rumor (I'll call it a rumor, just to be safe) is that Corning has a special type of glass which can be *pressed directly into grooves*, and is flexible enough not to break easily. It does not use petroleum. Glass generally is made of sand and gravel and such junk, of which we would seem to have plenty all over the place. Eureka! What are we waiting for? Smooth as glass? Maybe this would solve all our noise problems in one fell swoop. So to heck with vinyl.

Well, not quite. Maybe this glass deal isn't yet right around the corner. We still might have to make do with the noisy stuff, as described above. If we must, then we will. So common sense says think vinyl, all the way. Until Corning takes over.

If we use our good heads this way, we should be ready for anything—glass, vinyl, maybe even shellac. And I'm not even talking about the day when sawdust makes its debut, all unheralded, as a vinyl extender. Or maybe pumice, mica, chicken feed. Who knows. I'm not being bearish because these things will *not* happen. But in our present circumstances we must think that they *might* and be ready. So many more challenges to our ingenuity! It'll be exciting. AE

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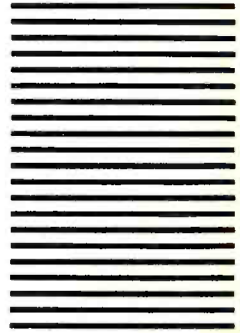

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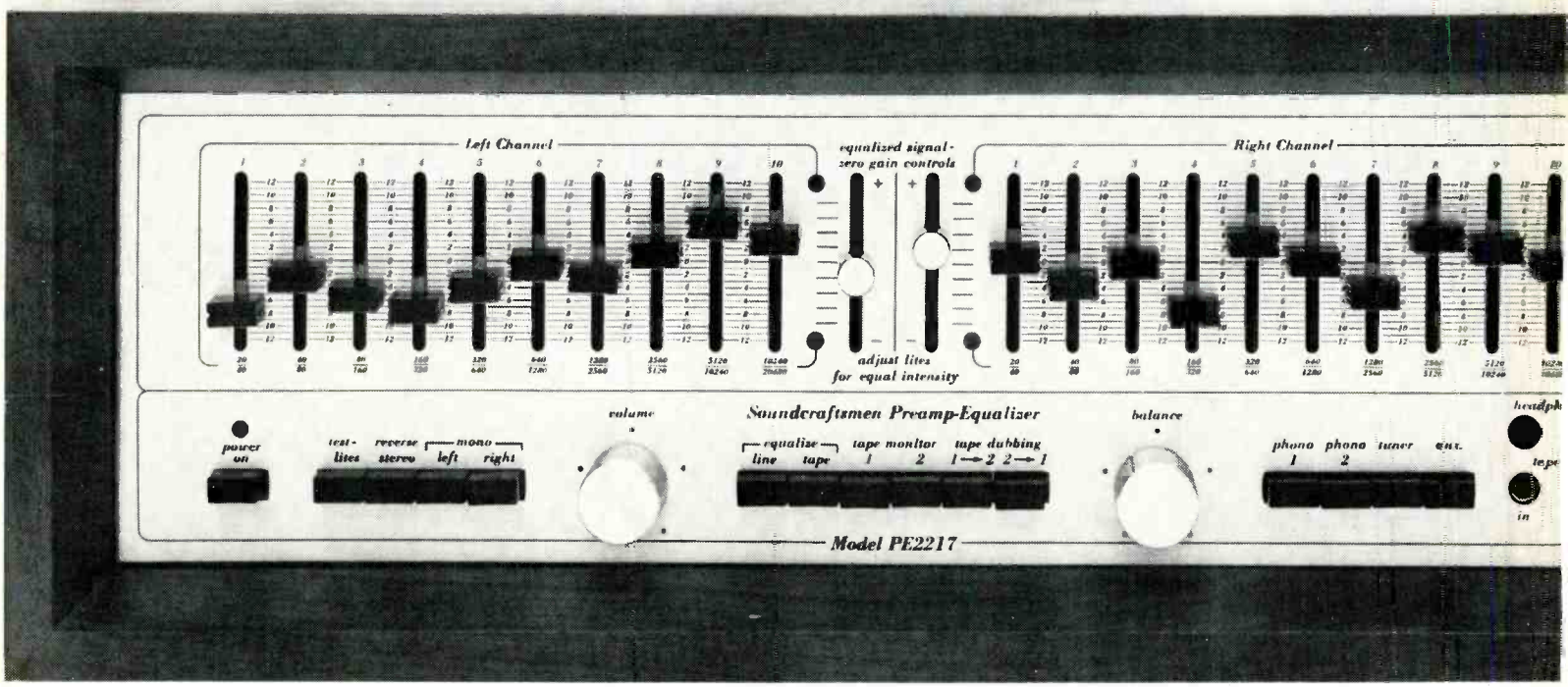

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From The Ortofon Test Record Library

Henning S. Madsen*

KEEPING TRACK of the test records available in the world is almost a full time job, particularly if one wants to know what is cut into the records and what this can tell you when testing a particular phonograph cartridge. Ortofon has quite a library but fortunately only a few of them are used frequently. The important measurements are: frequency response and crosstalk, output, square-wave response, distortion, tracking angle, and tracking ability.

These measurements can be conducted on various test records, but how does one choose from the big selection? Ortofon has been cutting quite a few test records themselves, and therefore it is natural to standardize on some of our own, but on top of these, quite a few other records are frequently used. In reviews and technical articles test results are reported, and it is necessary to be able to repeat these measurements. Since Ortofon cartridges are sold in most countries of the world, we end up using German DIN records as well as American and Japanese test records.

After a very brief description of how a magnetic cartridge works, our test record collection is listed. Finally the instrumentation which is necessary for carrying out various measurements is discussed together with typical results. The conclusion deals with the difficulties encountered in making measurements involving records. A standard measuring method applying some kind of a piezoelectric shaker is suggested. Two earlier articles about test records can be recommended (ref. 1 and 2). They give many fundamentals.

***Ortofon Manufacturing A/S, Valby, Denmark**

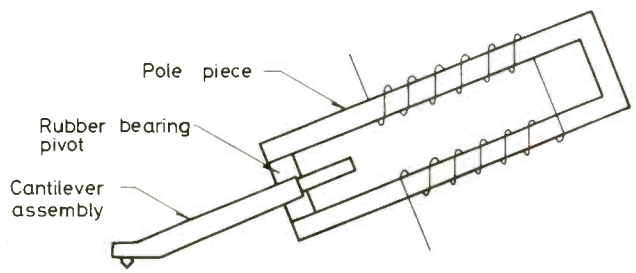

Fig. 1—Cantilever assembly in magnetic circuit.

Magnetic Phono Cartridge Principle

A magnetic phonograph cartridge is a transducing element capable of changing the mechanical movement to which the stylus is subjected in the record groove into electrical signals. The most common method is via a tiny rod magnet mounted at the end of the cantilever opposite the stylus in a magnetic airgap. Figure 1 illustrates how the armature is pivotly mounted at its center of gravity. Variations in the airgap cause a varying magnetic flux through the pole pins, which in turn induces an electrical voltage across the two surrounding coils connected in series.

The guiding mathematical formula for such a magnetic transducer is given below (ref. 3):

$$e = Tv$$

where v is the velocity; T is the electro-mechanical coupling factor which only depends on the magnetic circuit, and e is the voltage. This tells us that the magnetic pickup is a velocity transducer and not an amplitude transducer as the crystal pickup. This is important to know when talking about frequency response measurement. A flat frequency response measurement requires a test record with a constant velocity sweep

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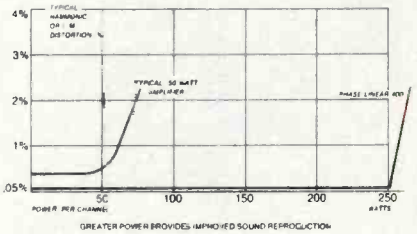

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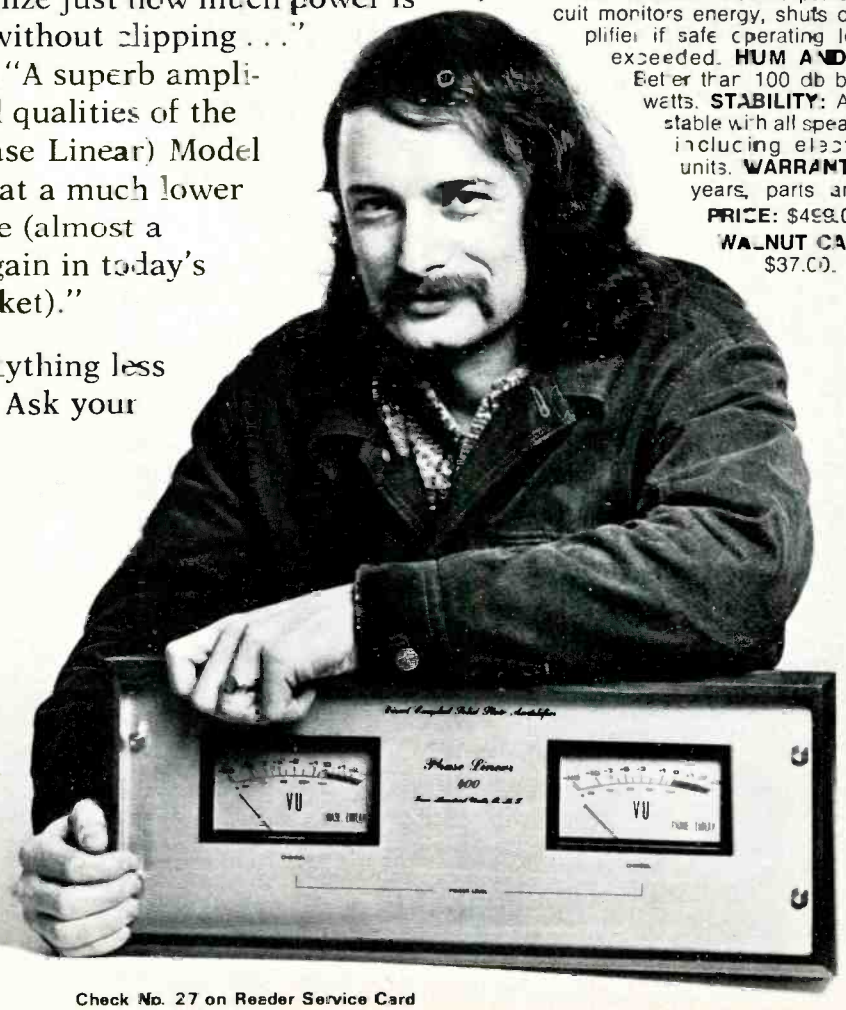

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from 20 Hz to 20 kHz or more. We will return to this subject later.

One special magnetic cartridge is the moving-coil cartridge. It works by moving a few turns of a coil in a homogenous magnetic field. A step-up transformer or prepreamplifier is normally required. Also this kind of transducer is of the velocity type.

Test Record Library

Table I lists the records presently in Ortofon's library. A description of what type of measurements can be performed with the records is also given, though a detailed specification is not included. Some of the test records have been the subject matter for technical papers. In these cases the reference literature is given.

Most Frequently Used Records

The output level at 1 kHz of both channels at a standard velocity of 3.54 cm/s rms is a rather important figure. The laboratory standard record is the CBS STR 100. It is a very simple measurement requiring only a record player and an electronic voltmeter. In between can be connected a left/right switching box with the standard electrical load of 47-Kohms built in. In this way also the separation or crosstalk can be measured.

Why is this measurement important? It is because it correlates with many other important figures like frequency response and tracking ability. If the pivot point is not correctly mounted, the moving mass is increased and a drop at 20 kHz results but at the same time the output voltage is either increased, that is when the pivot point is moved closer to the stylus allowing greater movement of the armature in the airgap, or decreased when the pivot is moved away from the stylus. The first situation also reduces the tracking ability at low frequencies because the compliance is reduced. One can see that a high output normally characterizes a cartridge with a low performance. On the other hand, there is a minimum output which can be tolerated in order to keep the signal-to-noise ratio high.

That the difference between the channels is not too great is measured at the same time. All these measurements are included in the performance test in the quality control at Ortofon. The OR 1013 is presently the test record which every single cartridge must play before leaving the factory. The relative level at 7.5 kHz, 15 kHz and 20 kHz is also tested.

The tracking ability at 300 Hz is also tested with this record. The laboratory standard is the German HiFi record No. 2 which has increasing levels from 20 µm peak to 100 µm peak at 300 Hz. A combination of watching the signal on a dual-beam oscilloscope and listening with headphones is used. Figure 2 shows the set-up.

Frequency response is a very common measurement in the laboratory. Usually the OR 2015 test record is used. It has a very fast sweep. The measuring set-up is shown in Fig. 3 and a typical result is shown in Fig. 4. The curve is not flat in the low end since it is not possible to cut a constant velocity of 3.54 cm/s down to 20 Hz as the cutterhead is not able to cut such large amplitudes. The RIAA characteristic is adopted on this record in the low end. Another test record, the CBS STR-100, has a constant amplitude up till 500 Hz and then a constant velocity from 500 Hz—20 kHz.

A more complicated measuring set-up is required if one wants the

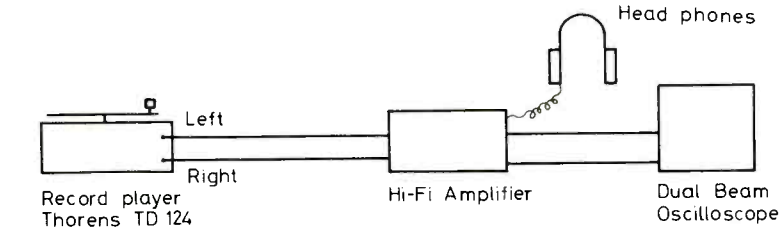

Fig. 2—Set-up for measuring tracking ability.

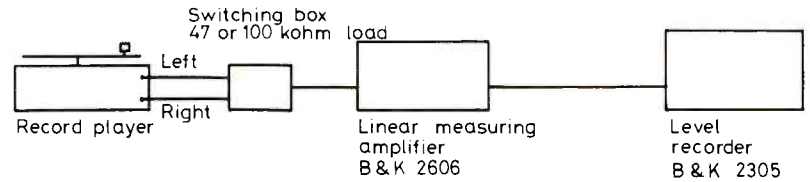

Fig. 3—Set-up for measuring frequency response and crosstalk.

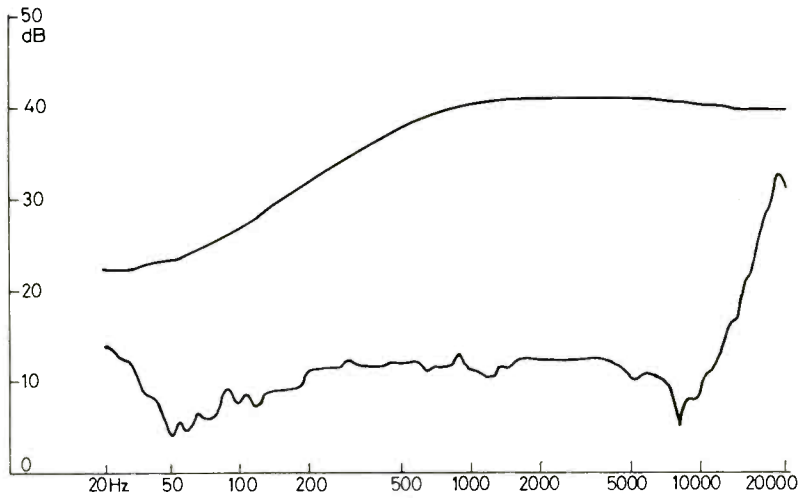

Fig. 4—Typical frequency response and crosstalk without low-end compensation.

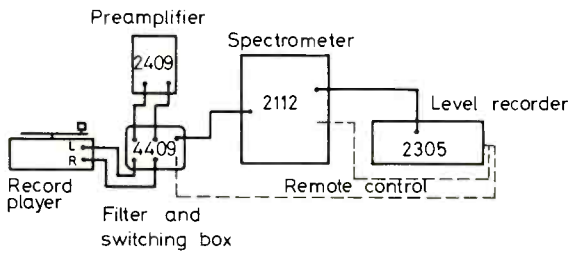

Fig. 5—Brüel & Kajar measuring set-up with filter.

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response to be flat down to 20 Hz. It involves a filter, and the crosstalk can only be measured if it is measured with a spectrometer. Brüel & Kjaer has a special arrangement for this measurement (Fig. 5 and ref. 4).

With the advent of the CD-4 four-channel system, new test records with frequency sweep up to 50 kHz were required. Ortofon has, in cooperation with the two other Danish companies, Brüel & Kjaer and Bang & Olufsen, cut the new test record QR 2010 which has a very fast sweep like the QR 2015. Measuring CD-4 cartridges can be done on the same measuring set-up if the switching box has a built-in alternative electrical load of 100 Kohms as required for CD-4.

The JVC record TRS 1005 is commonly used in the laboratory for measuring CD-4 cartridges. It has a sweep from 1 kHz to 50 kHz.

Distortion measurements are perhaps the most powerful measurements to establish the different cartridges' ability to reproduce sound from records. Distortion can be divided into harmonic distortion and intermodulation distortion. The latter of these is most frequently used and several test records are available.

At Ortofon the German DIN record 45542 is most frequently used. It has two different tones, 300 Hz and 3000 Hz. The low tone has a level of 12 dB higher than the high tone. If the low tone is filtered out, only the high tone should remain but some trace of the low tone will usually remain. See Fig. 6. These low-pitched variations can be detected with a wow-and-flutter meter, as shown in Fig. 7. Figure 8 shows the result for two Ortofon cartridges.

A recent test record from Shure, TTR 103, has tone bursts of 10.8 kHz with a repetition frequency of 270 Hz (ref. 5). This record will tell about tracking ability at higher frequencies because distortion is just a more technical term for tracking ability. The measuring set-up is shown in Fig. 9 with typical results in Fig. 10.

RCA presented long ago their two-glide-tone intermodulation test record (ref. 6). With the wave analyzer set at the difference tone, the distortion is measured up to 20 kHz at four different levels. Figure 11 shows typical results.

The harmonic distortion measurement has more recently become a very sophisticated test since new measuring equipment has made it possible to measure the second, third or any higher harmonic during a sweep. The measuring set-up involves a heterodyne ana-

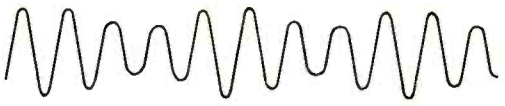

Fig. 6—3 kHz with 300 Hz modulation.

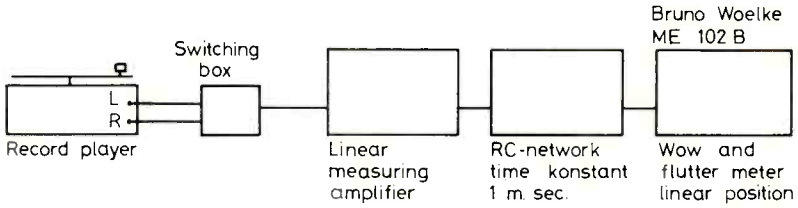

Fig. 7—Set-up for measuring frequency intermodulation distortion (FIM).

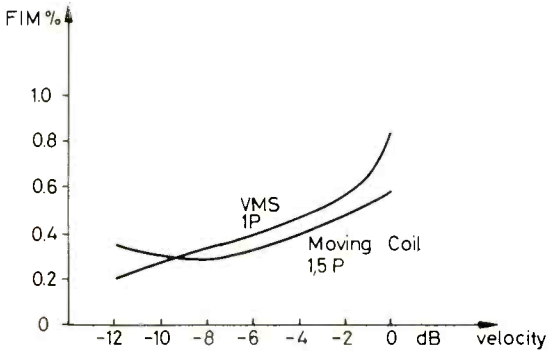

Fig. 8—Non-linear distortion (FIM). 0 dB: v(300 Hz) = 8 cm/sec, v(3000 Hz) = 2 cm/sec.

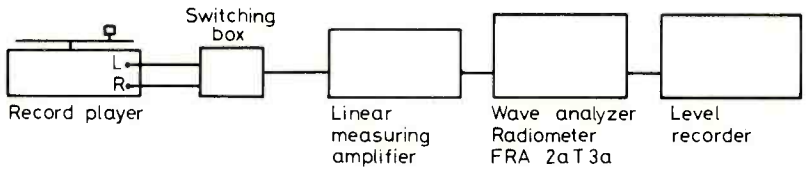

Fig. 9—Set-up for measurements incorporating a wave analyzer.

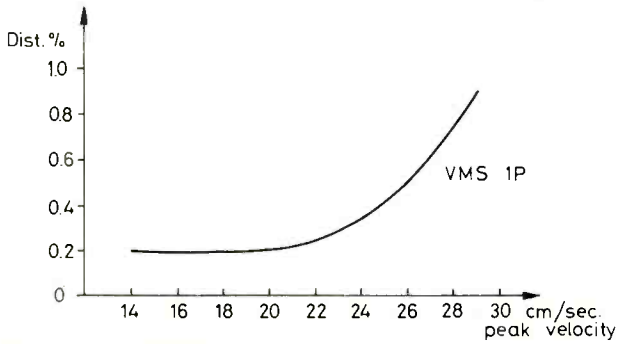

Fig. 10—High-frequency trackability. Test record TTR 103.

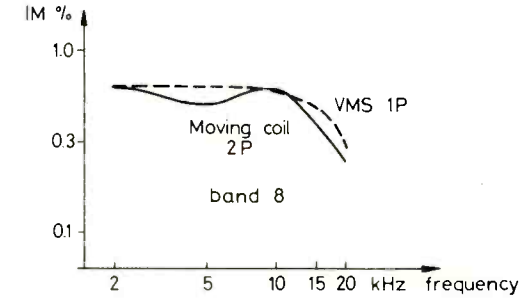

Fig. 11—Intermodulation. Two-tone glide.

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lyzer and a tracking frequency multiplier, as shown in Fig. 12. Figure 13 shows typical results.

The tracking angle is the angle between the record surface and a line from stylus tip to the pivot point. For many years this angle has been 15° as a standard, but recently a change to 20° has been recommended because 15° was very difficult to meet. It is very important that the angle with which the record is cut coincides with the tracking angle during replay, since the distortion increases tremendously if this is not the case. The way to measure the tracking angle is by means of distortion. Again, the German DIN record 45542 is adopted. Two different tones are cut into the record simultaneously with different angles from 6 to 30 degrees. When measuring with a wave analyzer adjusted to the sum frequency, one gets a minimum output when there is a coincidence between the pick-up tracking angle and the angle with which the groove is cut. See Fig. 9.

Square-wave response. As when testing loudspeakers and amplifiers, a square-wave response will tell a lot about the performance of a cartridge. The CBS record STR 111 has 1 kHz square waves. Figure 14 shows the result as watched on an oscilloscope. The overshoot and ringing should be as little as possible as this is a measure of difference between actual sound and reproduced sound.

Among *miscellaneous* records used for testing, the Pacific Transducer Corp. 102M and 103L are very informative. They have 70 Hz–10 kHz and 70 Hz–15 kHz sweep respectively, repeated at high rate so that the whole response can be watched on an oscilloscope. Output level, frequency response, and tracking ability can be detected at a glance.

The *absolute phase* of a cartridge is not important as long as only stereo is involved, but the four-channel CD-4 cartridge must have a positive response when the stylus moves to the periphery of the record. JVC has come out with the test record TRS 1004 for testing the absolute phase. It has a square-wave cut with a shorter positive cycle than negative cycle. For correct phasing, the shorter wave must always go positive if the measuring equipment is not changing the phase.

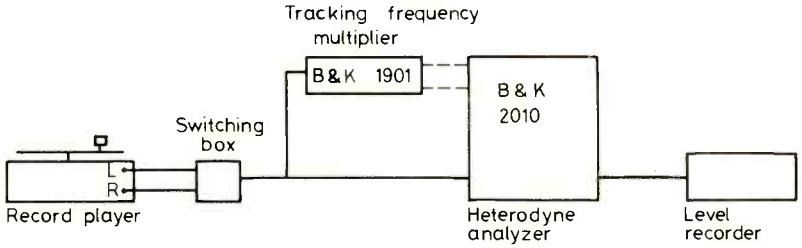

Fig. 12—Set-up for harmonic distortion sweep.

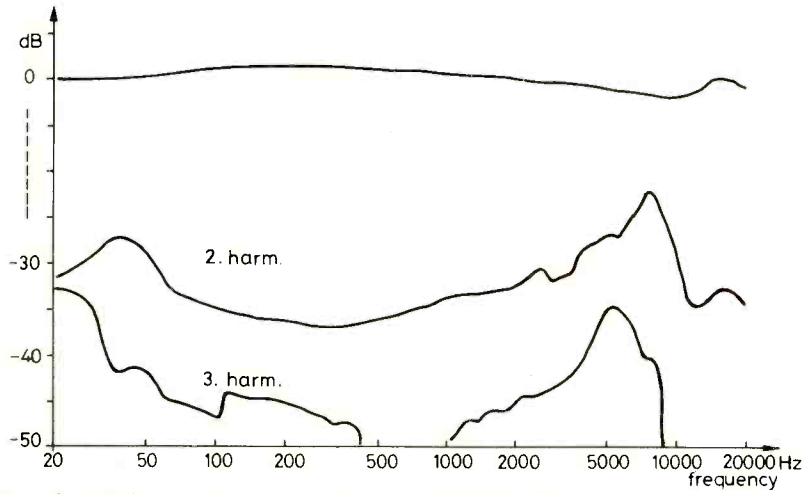

Fig. 13—VMS-cartridge, 1P. Frequency response, 2nd and 3rd harmonic. Test record QR 2009.

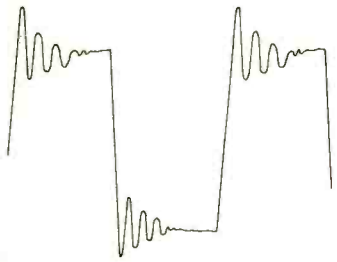

Fig. 14—Typical square-wave response.

New Standard Equipment

The foregoing were the various measurements and tests frequently performed on phonograph cartridges using test records. One big problem with these tests is that records are never 100 per cent the same. They change with wear, temperature, pressing, and material. In order to get reproducible results, one has to go through elaborate testing with standard cartridges. It would be of great help if someone would develop some kind of shaker which could be internationally adopted as a measuring standard. At Ortofon we often use a cutterhead directly but this cutterhead and the cartridge are both magnetic devices and this causes big shielding problems. The ideal shaker should be a piezoelectric device.

Of course it will always be necessary also to use test records since the action between the stylus and the moving groove never could be completely duplicated with a shaker, but a reference instrument which was the same for all parties involved would certainly be helpful.

The ultimate test is the listening test. Ortofon is paying an increasing attention to listening. What selections are we using? Well, this would lead into a new subject which gives material enough for a new article.

References:

1. Arnold Schwartz, *Test Records*, dB, April, 1969.
2. C.G. McProud, *How we test a phono cartridge*, AUDIO, August, 1972.
3. F. V. Hunt: *Electroacoustics, The Analysis of Transduction and its Historical Background*, Harvard U.P., Cambridge, Mass., 1954.
4. Brüel & Kjaer. Instruction Manual for level recorder type 2305.
5. C. Roger Anderson and Paul W. Jenrick: *A Practical High Frequency Trackability Test for Phono Pickups*, JAES, Vol. 20, No. 3.
6. J.G. Woodward and R. E. Werner: *High-Frequency Intermodulation Testing of Stereo Phonograph Pickups*, JAES, Vol. 15, No. 2.

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Brand name	Sweep	Spot Frequencies	Transient	Chan. recognition phasing balance	Music	Tracking Ability	Wow & Flutter	Rumble	Tone Arm Resonance	Tracking Angle	Intermodulation	Miscellaneous
Ortofon:												
OR 2015	S 20Hz-20kHz					300Hz	x	x	x			
QR 2010	S 20Hz-45kHz					1kHz	x	x	x			
OR 1013		1,7.5,15,20kHz		x		300Hz						
OR 1010 A		3, 10kHz										
OR 2008 C	M 20Hz-15kHz					100Hz						
OR 1006 A		1 kHz										
Shure:												
TTR 101					x	x						
TTR 102	S 20Hz-20kHz	1, 10kHz				x					400Hz-4kHz	
TTR 103						x					10.8kHz	
CBS:												
STR 100	S 40Hz-20kHz	x				x			x			
STR 111			1 kHz			300Hz					400Hz-4kHz	
STR 120	S 10Hz-50kHz		RIAA pink noise					x				
STR 140												
STR 160										x		
German HIFI:												
Record No. 1					x							
Record No. 2	S 20Hz-20kHz	x		x		300Hz		x				
Brüel & Kjaer:												
QR 2009	S 20Hz-20kHz											
RCA:												
12-5-78										x		
12-5-105											2 tone glide	
Miscellaneous:												
Ranger RRM-002		1.3kHz	1 kHz									
Dual PVK 321		1 kHz										
Goldring GMC-100		1 kHz				300Hz						
HIFI Sound HF S 69			random noise	x	x	x	x	x				
Decca SXL 2057		x										
Victor RG 1221/22		1kHz-50kHz										
Victor TRS 1003	S 1kHz-50kHz	1kHz-50kHz										
Victor TRS 1004		1kHz-40kHz										absolute phase
Victor TRS 1005	S 1kHz-50kHz											
W & G WG 25/2434		x	white noise	x	piano	x						translation loss
Pacific Transducer Corp 102M	M 70Hz-10kHz											
Pacific Transducer Corp 103L	M 70Hz-15kHz											
Grado RL 1758		1, 5, 10, 20kHz				300Hz						
DGG LAB 0968/20												
DGG LAB 01127=2A2/01126												
Toshiba PRC 7												

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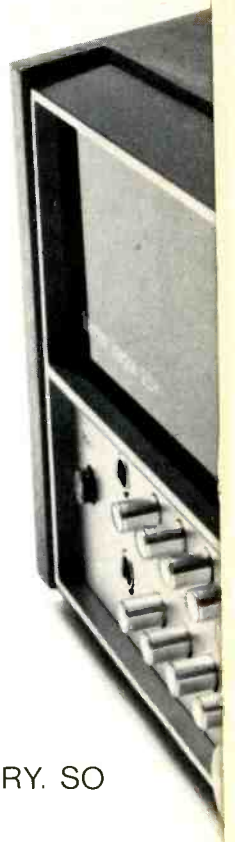

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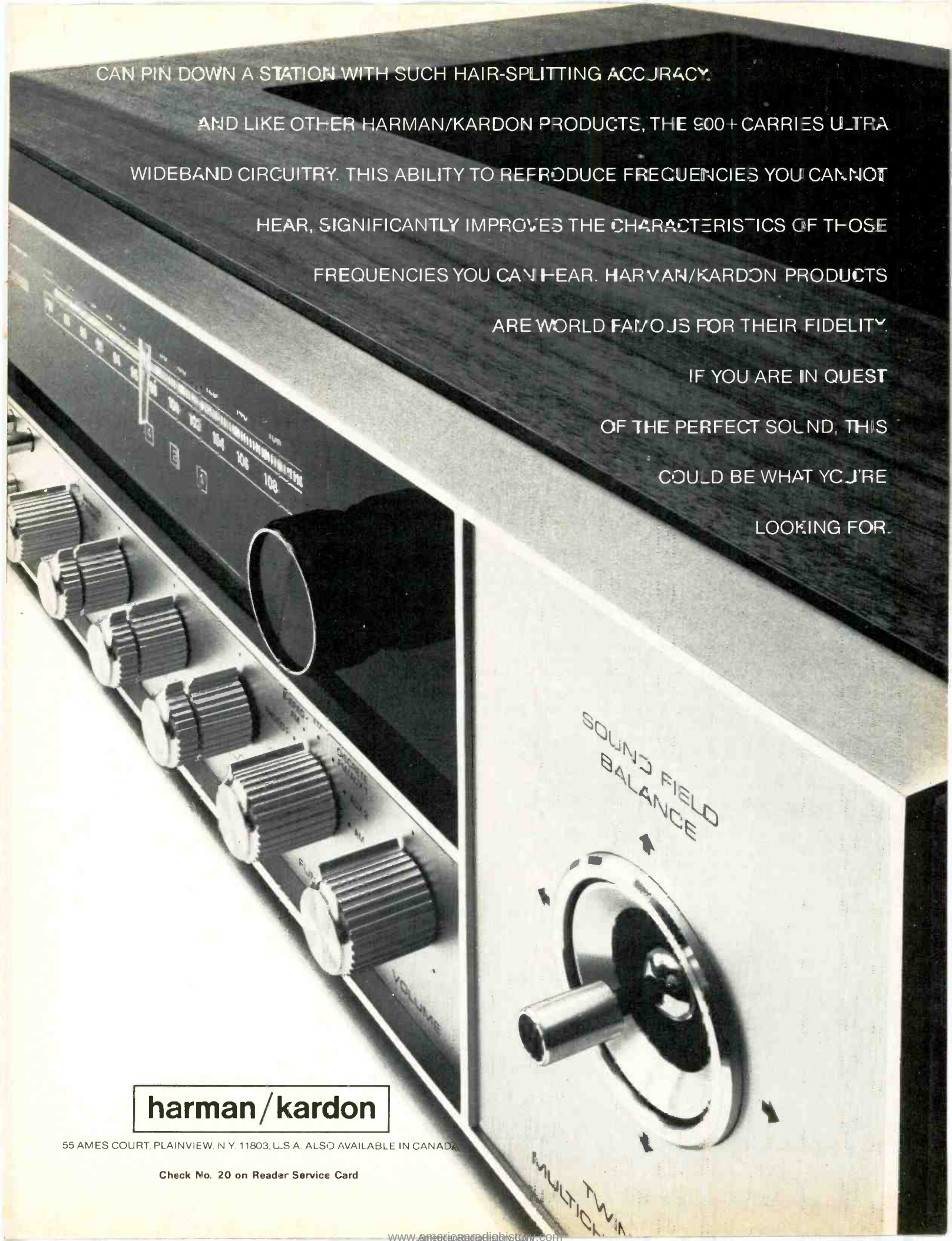

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Nine CD-4 Phono Cartridges Tested

B. V. Pisha

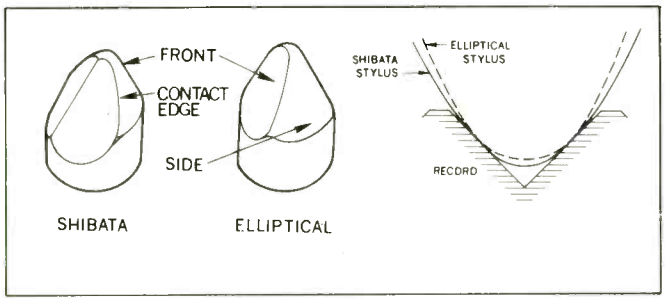
IN OCTOBER 1970, the world was first introduced to a new phenomenon in the audio industry—CD-4—as presented by the Victor Company of Japan (JVC) at the fall meeting of the Audio Engineering Society in New York. This development, together with the CBS/Sony SQ and Sansui QS matrix systems, constituted a revolution not unlike that which occurred in 1958 when the stereo record was introduced.

The advent of compatible, discrete, four-channel, CD-4 recordings, with their FM-modulated 30-kHz carrier, brought about the need to develop a cartridge that would have a wide frequency response—beyond 30 kHz and preferably to 50 kHz—so as to properly reproduce the new CD-4 records that have almost three times the frequency range of conventional records. To accomplish this, the new cartridge had to have a lower mechanical impedance (mass) of the vibrating system and an elevated high-end resonant frequency. The new stylus tip, as developed by Shibata in Japan, was designed to meet these requirements by enlarging the contact area of the stylus. The Shibata stylus has nearly the same tip radius as the elliptical stylus but, also, four times as much contact area with the record groove. Proper reproduction of the recorded signal in the 30 - 50 kHz region requires intimate stylus-to-groove contact. In order to seat the Shibata tip firmly into the record groove, an increased tracking force of two grams is required. However, because of its increased contact area, the two-gram tracking force of the Shibata tip can be expected to decrease by about four times both record and stylus wear, as compared to a conventional elliptical tip tracking at 1.5 grams.

In June 1971, JVC marketed in Japan a CD-4 demodulator and the first CD-4 cartridge with the Shibata stylus, identified as the 4MD-1X. This cartridge was never sold in this country, but is still available in Japan. To indicate the progress that has been made in the design of CD-4 cartridges, the early Victor 4MD-1X (manufactured by Victor) is profiled along with the other cartridges. The current JVC cartridge sold in this country is the 4MD-20X, manufactured by Audio-technica and similar to the AT-14S.

With RCA announcing that they were going to produce the CD-4 records, it did not take long for the industry to introduce the new-type cartridge. Currently, the influx of cartridges capable of reproducing the CD-4 records is increasing dramatically. It seems that every few weeks another cartridge manufacturer is announcing his intention to market the new-type cartridge. To date, only a few of the cartridges are available on the market. Most of these cartridges use the Shibata tip (Victor, Audio-technica, Technics, Ortofon, and Grace) either as a nude diamond or the diamond tip fused to a metal shank; Pickering/Stanton are using their Quadrahedral tip which is designed to cover the same contact area and is somewhat similar to the Shibata tip; whereas Grado Laboratories is continuing to use the conical tip, but with a low tip mass that obviates the need of a Shibata-type stylus to track CD-4 records. This, also, is the only standard cartridge with a very low inductance so that a lead as long as 20 feet may be used without a detrimental effect on the 30-kHz carrier signal.

As noted earlier, CD-4 cartridges are coming from many manufacturers and sometimes from unexpected sources. For example, AKG, well-known for their microphones and headphones, has been reported to be preparing to market a CD-4 type cartridge in three models, with the top cartridge to be designated the PU4E. The Diamond Stylus Co. of London also announced their forthcoming entry into the field with the MG14E and MD14D cartridges. (Additional CD-4 capable cartridges will be profiled later this year.—Ed.)



Equipment

To perform a reasonably accurate evaluation of the CD-4 cartridges, the playback equipment was chosen with great care. After trying a few direct-drive turntables, the Technics by Panasonic Model SP-10 and base was chosen because of its consistency and ability to preset the 33⅓- and 45-rpm speeds by individual speed controls. It is most important, when using test records at both 33⅓ and 45 rpm, that the speed regulation remain constant as the speed rate is shifted from one to the other. Vertical rumble for the SP-10 is specified at less than -65 dB (DIN A) and less than -70 dB (DIN B), while wow

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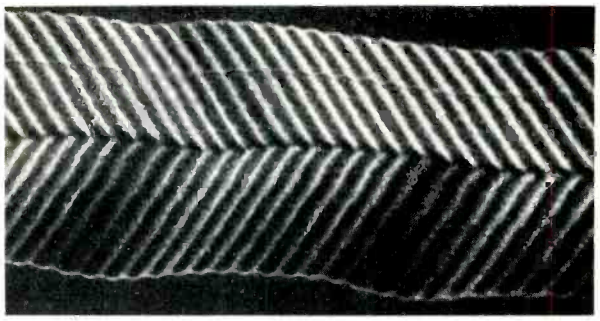

Discrete four-channel record groove as seen with the scanning electron beam microscope (original magnification 1500x). Each wall of the groove carries two sets of signals: the sum of the front and rear signals on the stereo base band and the difference of the front and rear signals on the carrier band.—*Courtesy RCA Records.*

and flutter of less than 0.03% wrms is claimed.

A number of tone arms were examined and the Audio-technica AT-1009 was installed on the Technics turntable. The AT-1009 tone arm was specifically designed for use with CD-4 cartridges. The arm is lifted and lowered by a pneumatic control. One advantage of the AT-1009 tone arm is that the antiskating can be varied in the dynamic state when checking this parameter. It is essential that the anti-skating pressure be adjusted as accurately as possible for all CD-4 cartridges so that the front and rear right channels reproduce properly with a minimum of mistracking distortion. Our experience indicates that this is of primary importance, expecially when lower-priced cartridges are installed in a tone arm or cartridges having other than the Shibata or Shibata-like configuration are used. The Audio-technica AT-1009 cable capacitance between the cartridge connectors and the phono plugs is 77 pF for the right and 78 pF for the left side.

The Shure Brothers C/PEK-3 Stereo Cartridge Analyzer with its accompanying test records (TTR-107 and TTR-103) was acquired and modified so that it could be used to evaluate the CD-4 cartridges with their 50-kHz bandwidth. The modified version of the C/PEK-3 will be available shortly from Shure Brothers. The C/PEK-3 was used to check channel orientation, crosstalk, balance tests, phase relationship, and antiskating and tracking force optimization. The monitor outputs on the C/PEK-3 with their 700-ohm output impedance appeared to introduce no recognizable errors, so the sweep-frequency response, IM distortion, and square-wave measurements were made from this point.

The sweep-frequency is plotted automatically on the Justi-Meter III, the graphic audio recorder designed and developed by the former editor and publisher of AUDIO, C. G. McProud, and marketed by Audio-technica U.S., Inc. The sweep source for this unit is supplied by the Bruel & Kjaer frequency-sweep record, QR-2009, with a range from 20 to 20,000 Hz. The high frequency-sweep range from 1000 to 50,000 Hz is supplied by the JVC test record, TRS-1005. The time of the sweep in the TRS-1005 is such that it matches the B&K QR-2009, assuming that the 1000-Hz reference tone is started at the 50 Hz mark on the chart. The actual high frequency-sweep starts at the 100 Hz line on the chart so that the recorded plot is just ten times the indicated frequency on the chart. We found the Justi-Meter III to be more than adequate for measuring cartridge performance. Its response closely matches a point-to-point response plotted for one cartridge. It is also quite useful for recording sweep-frequency response of amplifiers, filters and experimental units.

The measuring preamplifier has two positions—FLAT and BASS BOOST. The bass-boost position is equalized to provide a boost of 6 dB/octave below 500 Hz, and to be flat above that turnover frequency. IM measurements are made through the preamplifier which is set for BASS BOOST. The square-wave photographs are also made through the preamplifier when it is set to the FLAT position. The measuring preamplifier with its gain of 40 dB was described by C. G. McProud in AUDIO, June 1972.

To prevent the attenuation of the 30-kHz carriers, it is imperative that the cable capacitance between the cartridge and the input to the demodulator not exceed 100 pF total, which includes the wiring in the tone arm. This requirement places a burden on the salesman who is demonstrating a turntable that is quite a distance from the demodulator, as is the case in most every audio demonstration room. To overcome this problem, there is available from M&W Radio Corp., Williston Park, N.Y. 11596, a very small stereo booster amplifier voltage follower to which the turntable is connected by an audio cable not exceeding 100 pF per stereo side from the cartridge to the preamplifier. This unit properly loads the CD-4 cartridge. Subsequently, a length of audio cable not exceeding 8200 pF per stereo side may be connected between the output of the booster amplifier and the input to the demodulator. Up to 546 feet of low-capacitance cable (15 pF/ft) may be used without causing a significant response change or a phase rotation up to 50 kHz. The ideal location for this unit is inside the turntable base or separately close-by, thus eliminating the necessity of low capacity cable. The unit has been tested and approved by JVC for use in conjunction with CD-4 demodulators. We have tested all the cartridges in this evaluation with this booster amplifier, and all results were identical with the original results.

A Polaroid 350 camera is used to make all the square-wave photographs. The camera is fitted with a portrait lens adapter, as is the view finder, and a cable release. The camera is mounted on a rigid tripod and placed 19-20 inches from the oscilloscope. The intensity of the oscilloscope trace is reduced to a barely visible state after focusing the camera. With the black and white Polaroid film (speed 3000), the exposure time is three seconds. The exposures are made in a totally dark room to eliminate the light reflections from the face of the oscilloscope and to defeat the photocell shutter-control mechanism of the camera.

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The remaining test equipment consisted of an IM distortion analyzer; an audio VTVM that can measure down to one millivolt, full scale; a resistance, capacitance, and inductance bridge; oscilloscopes, low-capacitance connecting cables made up from any of the following: Alpha 2312 (15 pF/ft), Columbia 01395 (11 pF/ft), or Daburn 2693 (11 pF/ft), and the following test records: B&K QR-2009, JVC TRS-1005, Columbia STR-111, Columbia STR-100, Shure Brothers TTR-107 and TTR-103, DIN 2, and Grado Laboratories RL-1758. We tested only one cartridge per day, thus providing a 24-hour recovery period for the groove walls of the test records as well as the CD-4 music test (listening) records.

To eliminate the power line variations, an autotransformer followed by a Variac is employed and the line voltage constantly monitored for a reading of 117 volts. The room temperature for all cartridge tests was maintained at 69° F± 1° and the relative humidity was 33%± 3%.

Procedures

The cartridge to be tested is weighed on a gram balance-beam scale and the weight recorded. This is followed by the measurements of the d.c. resistance and the inductance. The stylus is then examined under the microscope at 200x to ascertain that it is clean and properly mounted.

Following these procedures, the cartridge is mounted onto the Audio-technica AT-1009 tone arm cartridge shell and adjusted for a 15 mm overhang. At this point the arm is balanced so that the stylus is about ⅛ in. above a blank acetate disc and the stylus tracking pressure is then set using a Shure SFG-2 precision stylus force gauge. It is generally accepted that the ideal stylus pressure for the Shibata stylus (or its equivalent) is two grams when playing CD-4 discs. However, because there may be some CD-4 cartridges in the near future that should not be used at a two-gram stylus pressure, the arbitrary stylus pressure of 1.75 grams is used for all the evaluations. Therefore, the optimum stylus pressure was *not* determined for any cartridge. However, the Grado FTR+1 was also evaluated at 1.25 grams stylus pressure. It was also noted that at the 1.75 gram stylus pressure all cartridges and the AT-1009 tone arm were able to track the worst warped records in our collection, including a washboard type warp, without noticeable distortion. Prior to actual use of the cartridge, the stylus is again cleaned. It takes only a little dust on the stylus or the CD-4 disc to cause mistracking with subsequent deterioration in the rear-channel signal.

To measure the channel orientation, crosstalk, and balance tests, the cartridge is connected to the Shure Brothers C/PEK-3 Stereo Cartridge Analyzer, using the TTR-107 test record. A phase check is then performed using the TTR-103 test record. This is an important test inasmuch as improper phasing of the cartridge and the rest of the connections employed in the CD-4 system will prevent a null point when adjusting the separation controls on the demodulator. The final testing of the cartridge with the C/PEK-3 analyzer is adjusting the antiskating device and performing the trackability tests, using the TTR-103 test record. There are three sections to the trackability test: high frequency, mid-frequency, and low frequency. The high-frequency tracking test is a 10.8 kHz pulse; the mid-frequency tracking test is a 1000 + 1500 Hz lateral-cut tone; and the low-frequency tracking test is a 400 + 4000 Hz lateral-cut tone. The low- and high-frequency tests have four velocities: 15, 19, 24, and 30 cm/sec. The mid-frequency test has four velocities: 20, 25, 31.5, and 40 cm/sec. The TTR-103 test record, in conjunction with the C/PEK-3 cartridge analyzer, is the best available means to determine the trackability of a cartridge, and the oscilloscope displays leave little or no doubt about its performance. This test is usually augmented by listening concommitantly to the reproduced sound via speakers. However, in most instances you can hear the buzzing the cartridge makes when it no longer can track a given band as well as see the distorted display on the oscilloscope. We must point out, however, that the majority of recorded music on discs generally has a velocity below 15 cm/sec and only occasionally does it reach 25 to 30 cm/sec.

Although the C/PEK-3 does measure cartridge output in millivolts, we measured the voltage output of each cartridge, correctly terminated, with the STR-100 test record and an audio VTVM capable of measuring microvolts. The signal output of the cartridge is measured at a signal of 3.54 cm/sec at 1000 Hz. This figure is divided by 3.54 to obtain a relative output in mV for a stylus velocity of 1 cm/sec, thus providing a comparative figure.

(Although all our Columbia and RCA test records were lost sometime ago, most of them have been replaced by the ever present generosity of W. Rex Isom [RCA] and Benjamin B. Bauer [Columbia] to whom we owe a debt of gratitude. We also wish to thank Ben Bauer for loaning us his copy of the CBS STR-111 test record so that we could examine the IM distortion and square waves of the cartridges. We regret that Columbia is not considering a new cutting of the out-of-stock but very important STR-111 test record, since it is the standard of the industry for IM distortion and square waves.)

IM distortion measurements are made using the STR-111 test record with the cartridge connected to the C/PEK-3 and the monitor output of the C/PEK-3 connected to the measuring preamplifier set to BASS BOOST. The output of the measuring preamplifier is connected to the IM distortion analyzer. Although IM distortion measurements are made on all bands of the STR-111, we follow the C. G. McProud reporting method and report only the +9 dB lateral modulation at 200 and 4000 Hz and the +6 dB vertical modulation at 200 and 4000 Hz. The resulting figures are only relative rather than absolute.

Continuing to use the STR-111, the square-wave photos are made, using the FLAT position on the measuring preamplifier.

For the frequency-response measurements, the monitor output of the C/PEK-3 is connected to the cartridge input of the Justi-Meter III graphic audio recorder. The B&K QR-2009 sweep record is used to record the sweep and separation from 20 to 20,000 Hz. The sweep from 1000 to 50,000 Hz is obtained from the JVC TRS-1005 sweep record. Recordings are made from both channels, but only the left channel is reported.

In all of the above test procedures, the total capacitance of the tone arm cable plus the interconnecting cables did not exceed 100 pF per channel.

When examining and comparing the data on the cartridges, it must be borne in mind that the data represents only the specific cartridges examined and can vary from cartridge to cartridge within any production run as well as from one production run to another.

CD-4 Cartridges and Demodulators

There are, at present, four separate demodulators, JVC 4DD-5, Lafayette 99H03345W, Panasonic SE-405H, and Pioneer QD-240, plus many receivers using the JVC system, under license. The Panasonic SE-405H is a unique demodulator in that it comes with a special semi-conductor-type cartridge, EPC-450C, that requires a 4-volt d.c. bias, which is available from the demodulator. This cartridge will be reported on in a future issue of AUDIO. A switch at the rear of the demodulator changes the cartridge input circuit to accept a moving-magnet cartridge or the Ortofon transformer for the SL15Q. The Panasonic demodulator is also unique in that the 30-kHz carrier level can be set for each channel simply by using the outer grooves of a Quadradisc and adjusting the carrier level until the 4 CH RADAR indicator just lights up. The JVC system

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requires that a 400-Hz distorted signal, supplied by the CD-4 adjustment record (not a test record), be converted to as pure a tone as possible (as heard and/or seen on the oscilloscope) by use of the 30-kHz carrier control. Separation adjustments are made in the same manner for all demodulators. Should it be impossible to obtain a null point when adjusting the separation control for one channel, reverse the cartridge connections for that channel and repeat the separation adjustment until a null point is reached. The inability to obtain a null point is usually caused by incorrect connections at the cartridge (one side being out of phase).

As a part of the cartridge evaluation, each cartridge is connected to the Panasonic SE-405H and JVC 4DD-5 demodulators, respectively, and adjusted using the following adjustment records: General, JVC 4DE-205 (45 rpm); for rechecking the separation setting, the 33⅓ JVC 4D-101, band 1; for rechecking the amplifier controls for equal volume (0 dB), the WEA PR 186; and for a final check of the separation, the 33⅓ JVC RG 1281, band 1. Normally, the 45-rpm JVC adjustment record, 4DE-205, is sufficient for all adjustments, including the 30-kHz carrier level for the JVC 4DD-5 and Pioneer QD-240 demodulator. The Pioneer and Lafayette demodulators have not been used in any of our evaluations, as yet.

Listening Evaluation

The listening evaluation is made using a variety of records representing the gamut of CD-4 recorded music. Therefore, each cartridge underwent a rigorous listening evaluation with the following experimental and commercially available records:

1. Harman/Kardon *CD-4 Calibration and Demonstration Quadradisc*—DPD1-0062
2. *Mancini Salutes Sousa*—RCA Quadradisc, APD1-0013
3. Carly Simon—*No Secrets*—Elektra Quadradisc, EQ-5049
4. Carolyn Hester—RCA Quadradisc, APD1-0086
5. RCA Quadradisc Highlights, DJD1-0072
6. Dolly Parton—*Bubbling Over*—RCA Quadradisc, APD1-0286
7. *Mandolin Serenade*—JVC CD-4 Quadradisc, CD4W-7016
8. Artur Rubenstein—*Rachmaninoff: Piano Concerto No. 2*—RCA Quadradisc, ARD1-0031
9. Debussy—*La Mer*—RCA Quadradisc, ARD1-0029
10. Virgil Fox—*Heavy Organ at Carnegie Hall*—RCA Quadradisc, ARD1-0081
11. Webersinke—*Famous Organ Works by J. S. Bach*—JVC, CD4K-7507E
12. Walter Carlos—*Switched on Bach*—CD-4 Experimental Record
13. Walter Carlos—*Clockwork Orange*—CD-4 Experimental Record
14. Difficult Passages—CD-4 Experimental Record

The speakers used in the listening evaluation are the Cerwin-Vega 211-R's in front and the AR-2a's in the rear. The last five records were used again when the speaker placement was reversed, the Cerwin-Vega 211-R's in the rear and the AR-2a's in front. It is realized that these speakers are disparate in their characteristics, especially in terms of efficiency. Because of these characteristics, the speaker placement was also used in the reverse. This is especially important when the sound emanating from the rear speakers is primarily ambience. The Integral System preamplifiers, Model 10, and amplifiers, Model 200 (100 watts per channel), were used to drive the speakers.

The last five records gave each cartridge a workout. In particular, the CD-4 experimental records, *Switched on Bach* and *Clockwork Orange*, are superb for checking CD-4 cartridges. Both of these records separated the excellent cartridge from the good cartridge with no uncertainty because of the highly explosive transients common to the Moog synthesizer.

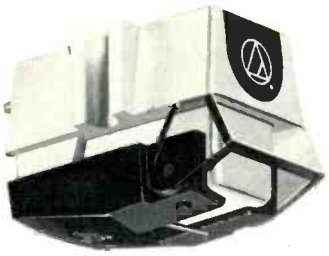
In most instances, the listening evaluation agreed with the measurement tests. However, the listening evaluation should be the final criteria by which a cartridge is judged. We believe in the axiom put forth many years ago by the late C. J. LeBel—"If it measures good and sounds bad, it *is* bad."

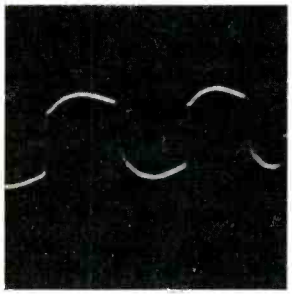
Conclusions

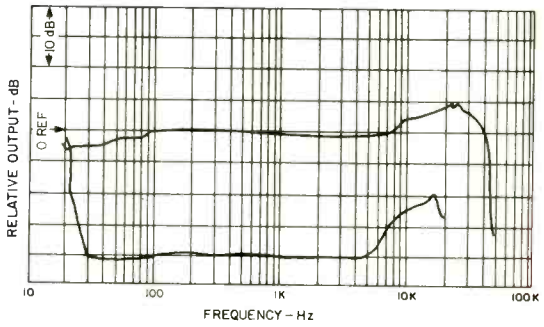
All the CD-4 cartridges evaluated reproduced the CD-4 recordings well and the resultant sound was pleasant to the ear in the listening evaluation. Three cartridges stand apart from the rest to this listener—Audio-technica AT20SL, Ortofon SL15Q, and Audio-technica AT15S. The AT20SL and SL15Q are considered to be equal in our listening evaluation with the AT15S a close second. These three cartridges appear to have a better definition of individual instruments, especially of the percussive nature. The Audio-technica AT20SL and the Ortofon SL15Q reproduced the last five records, and especially the last three, smoothly, with a very clean sound.

In a letter written to AUDIO (November 1973), Mr. James H. Kogen, vice president, Shure Brothers, Inc., made a point that is well-taken—that a separate cartridge should be used for stereo reproduction and another for CD-4 reproduction. In general, we agree with Mr. Kogen. However, we take a small exception and feel from our own listening that the very top CD-4 cartridges can play both without a trade-off.

Audio-technica AT20SL







Audio-technica cartridges use two independent permanent magnets mounted at 45-degree angles, perpendicular to the two sides of the record groove. Each magnet is an electrical generator reproducing only the signal from one side of the record groove, thus maximizing separation. This model is identical to the AT15S, except that the AT20SL is hand-selected for all parameters, including flattest possible response to 50 kHz. Frequency response is flat from 50 Hz to 8 kHz ± 2 dB, + 3 dB

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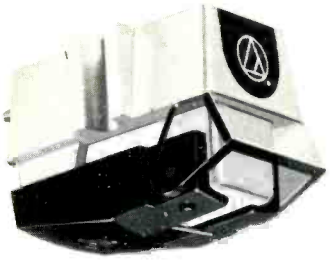
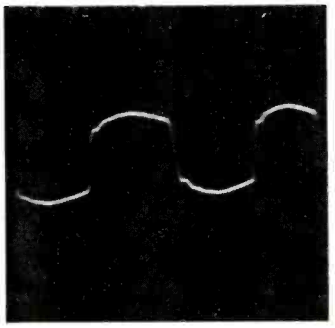
at 10 kHz, and +4 dB at 20 kHz. The double peaks at about 23 and 26 kHz are +5 dB, then the response drops to +1 dB at 40 kHz. Separation averages 20 dB from 100 Hz to 5 kHz, down to 15 dB at 10 kHz and 16 dB at 20 kHz. Trackability is one of the best we have ever seen. The AT20SL is one of the two top CD-4 cartridges reported here. Its sonic clarity is superb, one of the smoothest we have ever encountered. Transient response is excellent. One does not realize all the sounds present on a CD-4 recording of the Moog synthesizer, as well as both electronic and pipe organs, until played with a top-of-the-art cartridge.

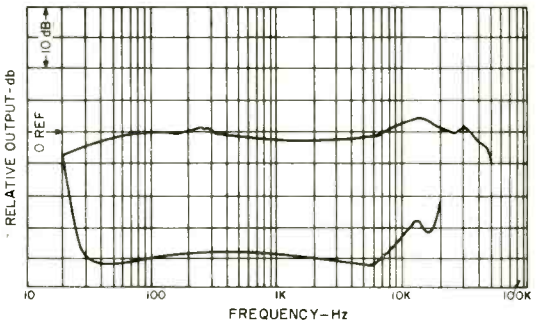
Wt. 9.03 g; d.c. res. 550 ohms; Ind. 378 mH; Output 0.65 mV/1-cm/sec; IM dist. 2.5% lat., 3.4% vert.; Crosstalk −22 dB; Ch. Bal. 0 dB; Trackability: High freq. (10.8 kHz pulsed) 30 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 31.5 cm/sec; Low freq. (400 + 4000 Hz lat. cut) 30 cm/sec. The stylus is a nude diamond with the Shibata configuration. $150.00.

Check No. 66 on Reader Service Card

Audio-technica AT15S





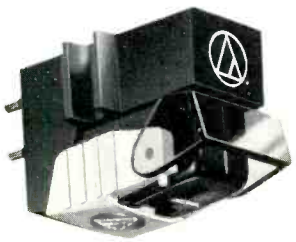


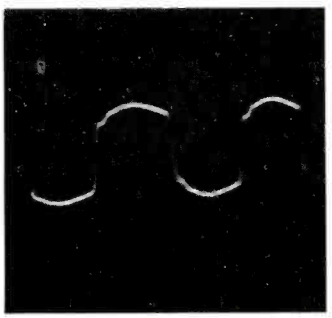
Construction is identical to the AT20SL, since the top of the line cartridge is hand-picked from the production run of the AT15S. Frequency response is flat from 50 Hz to 8 kHz ± 2 dB, + 2 dB at about 15 kHz, + 1 dB at 20 kHz, + 1 dB at 30 kHz, -2 dB at 40 kHz, and -5 dB at 50 kHz. Separation averages 20 dB from 50 Hz to 10 kHz, down to 16 dB at 12 kHz and 12 dB at 20 kHz. Musically, the AT15S is not quite as good as the AT20SL. Transient response is excellent, as is the bass response. Sonic clarity is excellent, particularly in electronic synthesizers, electronic and pipe organ, and piano. Overall, it produces crisp, clean sound.

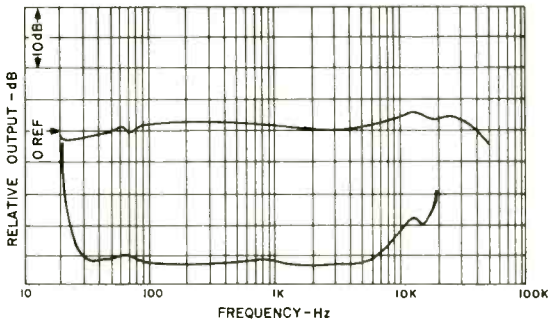
Wt. 8.52 g; d.c. res. 445 ohms; Ind. 408 mH; Output 0.83 mV/1-cm/sec; IM dist.: 2.6% lat., 2.4% vert.; Crosstalk −24 dB; Ch. Bal. 0.5 dB; Trackability: High freq. (10.8 kHz pulsed) 30 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 25 cm/sec; Low freq. (400 + 4000 Hz lat. cut) 19 cm/sec. The stylus is a nude diamond with the Shibata configuration. $100.00.

Check No. 67 on Reader Service Card

Audio-technica AT14S







The AT14S is next to the lowest priced CD-4 cartridge with a Shibata stylus in this line. The response curve is one of the flatest we have encountered, ± 2 dB from 30 Hz to about 45 kHz, and down −3 dB at 50 kHz. Separation is about 20 dB throughout the spectrum up to about 17 kHz and then decreases to 9 dB at 20 kHz. Although the sound is crisp, it has a tendency towards stridency at the high frequencies and the bass has a slight tendency towards being boomy, especially low bass. There is some distortion present in the loud bass passages in the rear channels as well as in some difficult music passages. This cartridge and the JVC 4MD-20X are reported to be identical—both are made by Audio-technica.

Wt. 6.5 g; d.c. res. 446 ohms; Ind. 383 mH; Output 0.69 mV/1-cm/sec; IM dist.: 2.4% lat., 1.7% vert.; Crosstalk −30 dB; Ch. Bal. 0.5 dB; Trackability: High freq. (10.8 kHz pulsed) 24 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 31.5 cm/sec; Low freq. (400 + 4000 Hz lat. cut) 24 cm/sec. The stylus is a nude diamond with the Shibata configuration. $75.00.

Check No. 68 on Reader Service Card

Grace F8/F

The Grace cartridge is manufactured by the Shinagawa Musen Co., Ltd., in Japan. We have not seen many examples in the West, though Sumiko, P.O. Box 5046, Berkeley, Calif. 94705, has started importing two Grace cartridges, this model and the F8/L. The response curve is ± 3 dB from 20 Hz to about 10 kHz, dropping to −4 dB at 10 kHz, then slowly rising to −2 dB at 30 kHz, and down −6 dB at 50 kHz. Separation is about 19 dB throughout the spectrum to 20 kHz. Musi-

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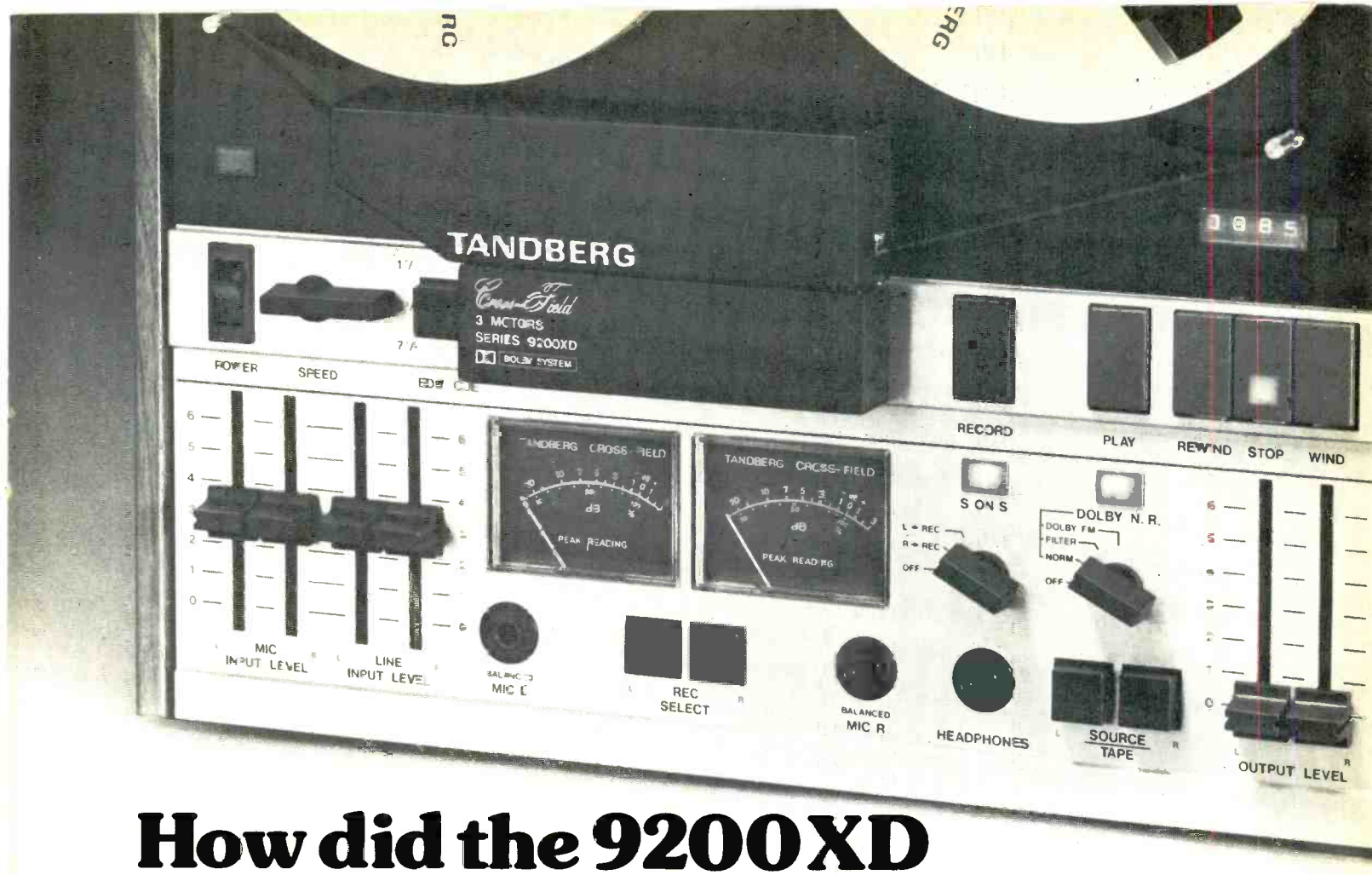

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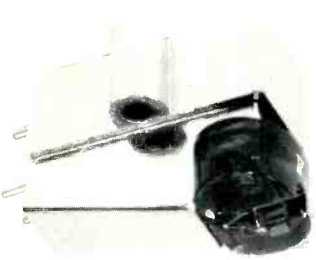
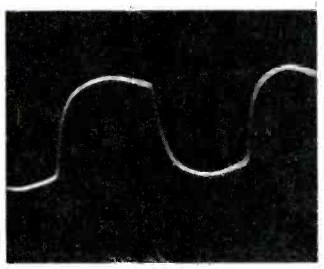
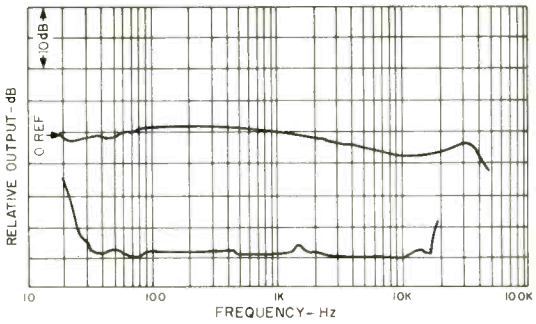




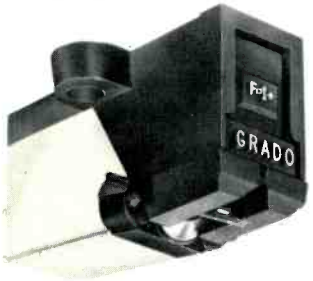


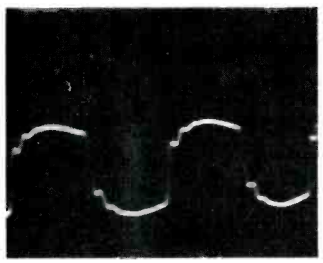
cally, the high frequencies appear to be a bit strident. Some tracking difficulties and distortion were encountered in loud mid-frequencies and bass. The overall sound was a little hard.

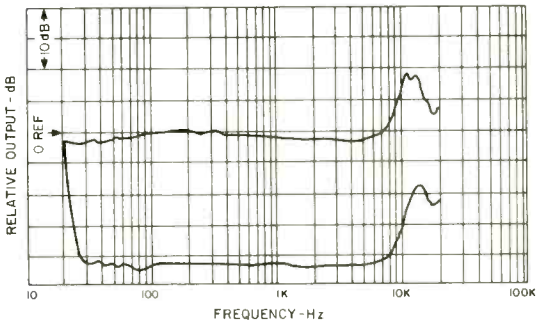
Wt. 6.5 g; d.c. res. 472 ohms; Ind. 359 mH; Output 0.58 mV/1-cm/sec; IM dist.: 0.8% lat., 2.3% vert.; Crosstalk −27 dB; Ch. Bal. 0 dB; Trackability: High freq. (10.8 kHz pulsed) 24 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) less than 20 cm/sec; Low freq. (400 + 4000 Hz lat. cut) less than 15 cm/sec. The stylus is a nude diamond with the Shibata configuration. $109.95.

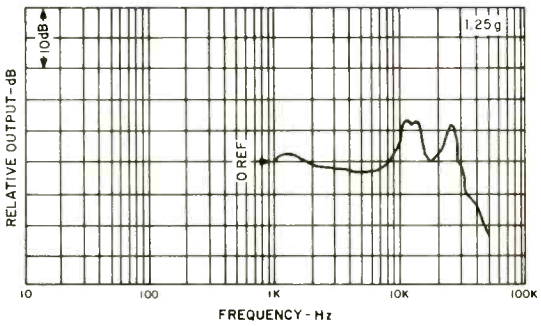
Check No. 69 on Reader Service Card

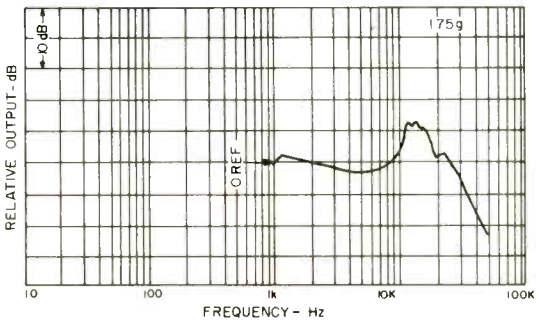
Grado Laboratories FTR+1











This is the sleeper among the CD-4 cartridges. The stylus is a spherical diamond (0.5 mil) with a tip mass so low that it doesn't require special facets to track CD-4 records. And the price quoted is $11.95. Although we used a stylus tracking force of 1.75 g for all the cartridges, we made an exception for the FTR+1 and also measured it at a tracking force of 1.25 g, as suggested by Grado Laboratories. The cartridge is a type of variable reluctance, not too different from the old General Electric variable reluctance cartridge. Because of its low inductance, up to 20 feet of cable may be used without any effect upon the very high frequencies. The frequency response curves were reasonably identical from 20 Hz to 20 kHz at both 1.75 and 1.25 g tracking force. At 1.25 g the response is ± 2 dB from 20 Hz to 8 kHz, rising to + 9 dB at about 13 kHz, + 1 dB at 20 kHz and about + 7 dB at about 26 kHz and then falling off rapidly, +1 dB at 30 kHz, −8 dB at 40 kHz, and −13 dB at 50 kHz. At the 1.75 g tracking force, there is a +2 dB peak at about 23 kHz and then rapidly falling off, −2 dB at 30 kHz, −8 dB at 40 kHz, and −13 dB at 50 kHz. It appears that the 1.25 g tracking force brought about another peak at about 26 kHz, whereas at the 1.75 g tracking force there is only a minor peak at about 23 kHz. Separation is about 21 dB from 50 Hz to 10 kHz, dropping to 17 dB at 15 kHz and 15 at 20 kHz. Musical response is relatively clean, but is not as crisp as with others. Transient response is good. It is a bit strident in the high end with some distortion at the very high end. This cartridge acquitted itself well with the bass organ pedals as well as the Moog synthesizer. Some distortion was noticed in the very loud musical passages.

This is an amazing cartridge when one considers its price. We would not hesitate to recommend it for medium-priced systems or OEM use.

Wt. 5.4 g; d.c. res. 710 ohms; Ind. 58.7 mH; Output 0.61 mV/1-cm/sec; IM dist. 2.3% lat., 2.7% vert. (3.2% vert. at 1.25 g.); Crosstalk −28 dB (−30 dB at 1.25 g.); Ch. Bal. 0.75 dB (0 dB at 1.25 g.); Trackability: High freq. (10.8 kHz pulsed) 24 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 25 cm/sec (20 cm/sec at 1.25 g.); Low freq. (400 + 4000 lat. cut) 19 cm/sec (15 cm/sec at 1.25 g.). $11.95.

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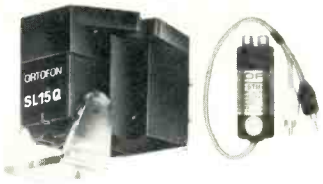
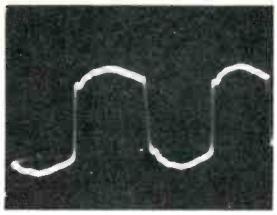
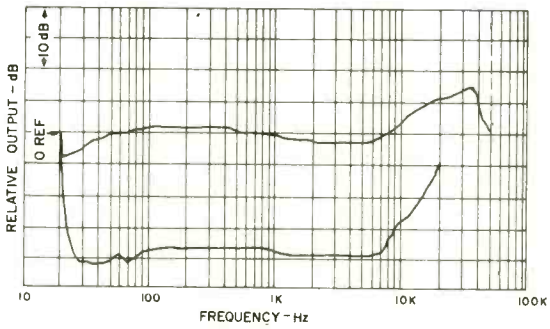
Ortofon SL15Q





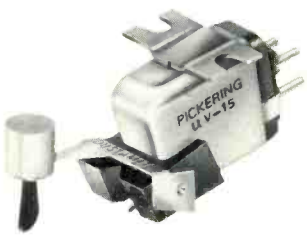


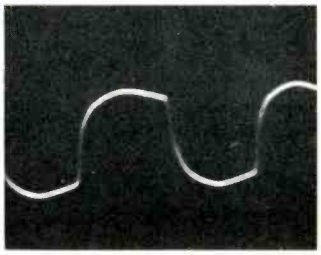
This is the only moving coil cartridge among the current CD-4 cartridges and requires a transformer to step up the voltage for the average preamplifier. Frequency response is ± 2 dB from 40 Hz to 13 kHz, +5½ dB at 20 kHz, +8 dB at 40 kHz, and +2 dB at 50 kHz. Separation is generally about 17 dB across the spectrum to 9 kHz, dropping to 16 dB at 10 kHz, 15 dB at 15 kHz, and 11 dB at 20 kHz. This cartridge is tied with the Audio-technica AT20SL as one of the two top cartridges reported here. Like the AT20SL, its sonic clarity is superb and it is one of the smoothest cartridges we have encountered. Transient response is excellent. All the sounds recorded by the Moog synthesizer are reproduced clearly as are the electronic and pipe organ sounds. This is a state-of-the-art cartridge. We might add that the transformer should be marked to identify the left and right channels. The white dot on the transformer is for the right cartridge lead and the white phono plug from the transformer goes to the right phono jack on the demodulator.

Wt. 7.6 g; d.c. res. 2.55 ohms; Ind. 112 *micro* H; Output with transformer 2.79 mV/1-cm/sec; IM dist. 1.5% lat., 2.0% vert.; Crosstalk −26 dB; Ch. Bal. 1.5 dB; Trackability: High freq. (10.8 kHz pulsed) 30 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 25 cm/sec; Low freq. (400 + 4000 Hz Lat. cut) 19 cm/sec. The stylus appears to be a nude diamond with the Shibata configuration. $160.00 (estimated).

Check No. 71 on Reader Service Card

Pickering UV-15/2400-Q





This Pickering cartridge is considered the first U.S.-made CD-4 cartridge. The response curve is quite flat, ± 3 dB from 20 Hz to over 20 kHz, −3 dB at 10 kHz, +2 dB at 20 kHz, +4 dB at 30 kHz, +1.5 dB at 40 kHz, and −4 dB at 50 kHz. The resonant peak is from about 21 kHz to 30 kHz. Separation

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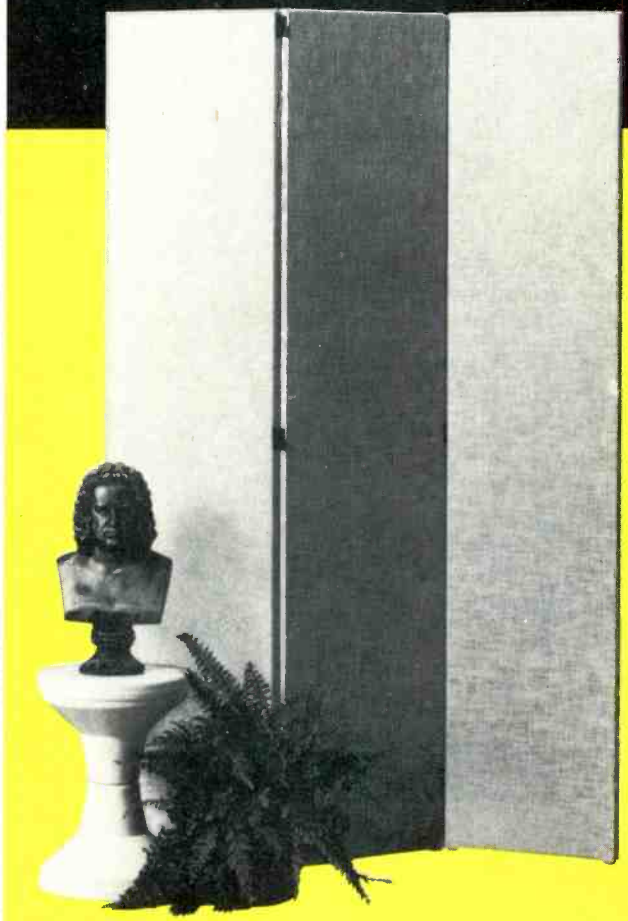

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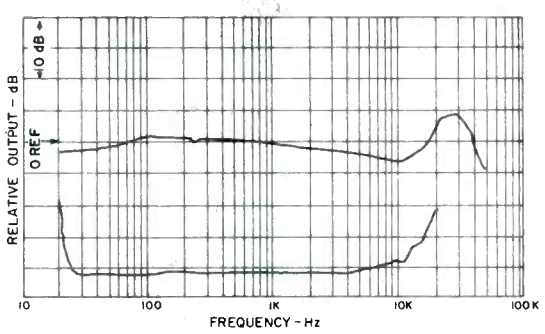
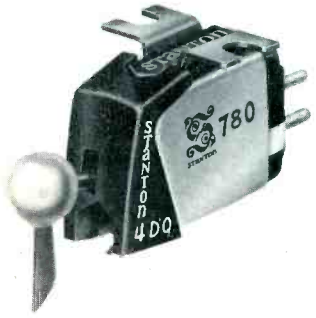


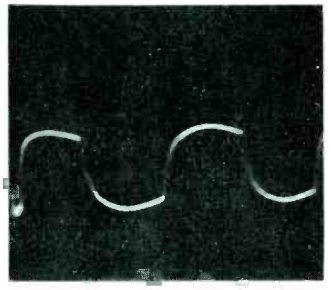
averages 21 dB from 50 Hz to about 8 kHz, down to 17 dB at 10 kHz, and 11 dB at 20 kHz. This cartridge has the lowest IM distortion of the cartridges reported herein. If some parameters can be redesigned and the IM distortion remain as is, it would be a superior cartridge. Musically, the high frequencies sound a little strident, particularly on string instruments. Transient response is good. Some tracking distortion was evident on loud organ bass passages. There was some distortion in the mid-frequencies. The overall sound is a little hard.

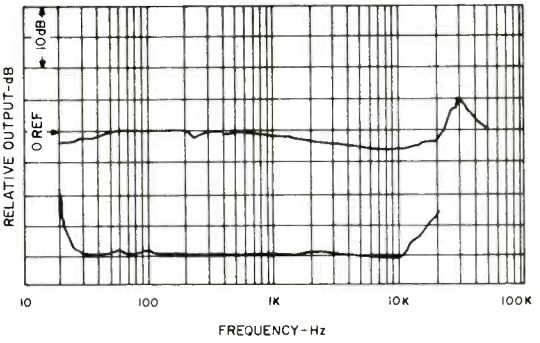
Wt. 5.66 g; d.c. res. 672 ohms; Ind. 297 mH; Output 0.58 mV/1-cm/sec; IM dist: 1.0% lat., 0.8% vert.; Crosstalk −25 dB; Ch. Bal. 0.75 dB; Trackability: High freq. (10.8 kHz pulsed) 24 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) less than 20 cm/sec; Low freq. (400 + 4000 Hz lat. cut) less than 15 cm/sec. The diamond stylus has a Quadrahedral configuration which is not unlike the Shibata configuration. Both the back and front end of the stylus appear to have identical facets. Evaluation of this cartridge was performed with the "Dustamatic" brush removed. $124.95.

Check No. 72 on Reader Service Card

Stanton 780/4DQ





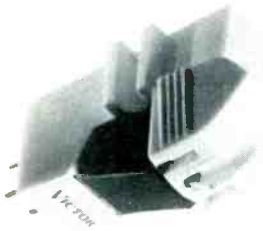


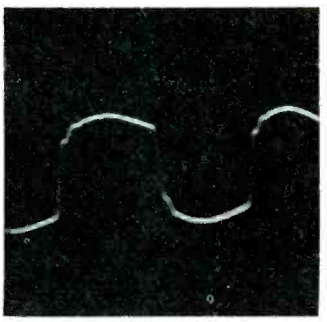
This cartridge is considered to be the second U.S.-made CD-4 cartridge. The response curve is ± 3 dB from 20 Hz to about 25 kHz, +5 dB at 30 kHz, +3 dB at 40 kHz, and +0.5 dB at 50 kHz. As with most of the other CD-4 cartridges, the resonant peak is at 30 kHz. Separation averages about 19 dB to 9 kHz, 17 dB at 10 kHz, and 11 dB at 20 kHz. This cartridge also has a very low IM distortion. Perhaps, like the Pickering, if some parameters could be altered, it too would be a superior cartridge. Musically, the Stanton 780/4DQ had some difficulties with loud organ bass passages and the high end was a bit strident. There was some distortion present in the mid-frequencies. The overall sound is a little hard. Evaluation was made with the dust brush attached to the cartridge, but compensated as described in the instructions.

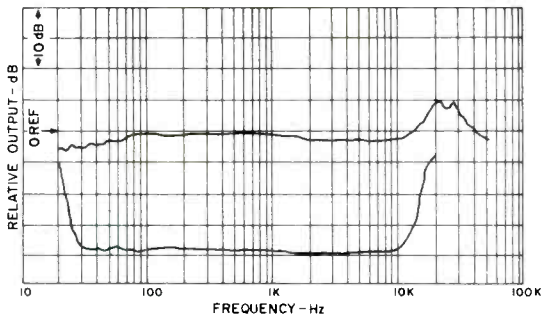
Wt. 6.64 g; d.c. res. 655 ohms; Ind. 291 mH; Output 0.54 mV/1-cm/sec; IM dist: 1.2% lat., 1.7% vert.; Crosstalk −25 dB; Ch. Bal. 0 dB; Trackability: High freq. (10.8 kHz pulsed) 24 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) less than 20 cm/sec; Low freq. (400 + 4000 Hz lat. cut) less than 15 cm/sec. The diamond stylus is a Quadrahedral, similar to that used in the Pickering UV-15/2400-Q. $125.00.

Check No. 73 on Reader Service Card

Victor 4MD-1X







This cartridge is considered to be the first CD-4 cartridge to be marketed. Although it has never been available in the U.S., it is still sold in Japan. The frequency response is flat from 40 Hz to above 16 kHz ± 2 dB, then climbs to +5 dB at 20 kHz and 28 kHz, down to +1 dB at 40 kHz and −1 dB at 50 kHz. Separation is 19 dB from 100 Hz to 10 kHz, dropping to 15 dB at 15 kHz and 9 dB at 20 kHz. Musically, we find it to be a bit muffled at the high end. The bass is adequate although some tracking difficulties were encountered in the pedal notes of the electronic and pipe organ. Transient response is somewhat muddy and there was some distortion in the mid-frequencies. Distortion was evident when reproducing music recorded on the Moog synthesizer.

Wt. 7.24 g; d.c. res. 446 ohms; Ind. 405 mH; Output 0.62 mV/1-cm/sec; IM dist. 1.3% lat., 6.8% vert.; Crosstalk −30 dB; Ch. Bal. 1 dB; Trackability: High freq. (10.8 kHz pulsed) 30 cm/sec; Mid-freq. (1000 + 1500 Hz lat. cut) 25 cm/sec; Low freq. (400 + 4000 Hz lat. cut) 24 cm/sec. The stylus is a nude diamond with the Shibata configuration. N.A. in U.S.

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Quadra-Direction Discrete Compatible Stereo

Conclusion

Fumitaka Nagamura*

CONCERNING NUMBERS of channels for disc records, the conventional philosophy, based on which contemporary stereo and quadraphonic systems have been developed, interprets the number of channels reproducible from discs to be limited to two, simply due to the fact that only two channels of signal transmission are employed in disc-cutting.

However, the fact that recording signals input to discs in cutting are along two axes spatially perpendicular to each other, makes it possible to input an infinite number of channels by selecting appropriate magnitude ratios and phase relationships for signal vectors projected on the two axes. Then in reproduction, detection of the infinite number of recorded signal vectors must be effected separately in three or more sectors of the domain covered by such recorded vectors, i.e. a 360° circular distribution around the no-signal center, in order to detect all of the signals without duplication. Thus, symmetry and efficiency dictate the minimum number of channels for detection to be four.

*N.F. Farrd Systems, Tokyo

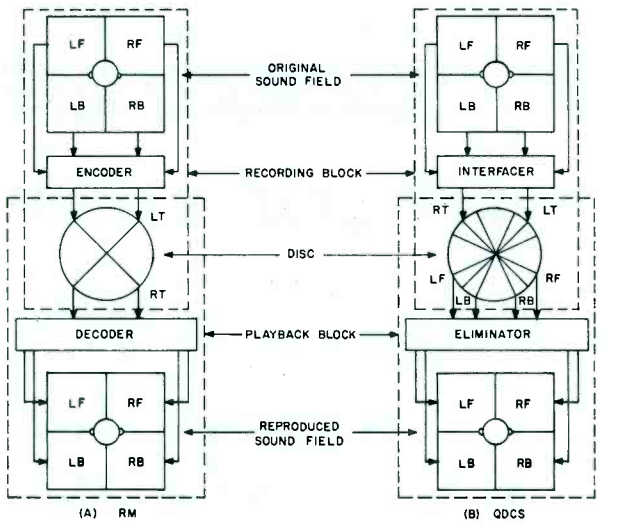

Fig. 18—Comparison of RM and QDCS.

Figures 18 (A) and (B) illustrate the foregoing approach, i.e. QDCS, in comparison with RM which is the closest thereto on the recording side among conventional systems.

Figure 18 (A) detects, through only the two transmission channels, such signals as had been specifically arranged spatially to eliminate all duplication, so that in effect it has cast away a portion of the fundamental capabilities of discs.

QDCS represented by Figure 18 (B), on the other hand, directly detects such information as recorded within each predesignated sectorial domain, so that it is a system that not only retains the same basic quality as that of conventional stereo systems, but also fulfills the fundamental continuity, balance, and symmetry of recorded and reproduced sound.

By symbolizing these two approaches using the often used terminology of n-2-m, n-4-m, etc., they may be represented as follows:

RM: m - 2 - m′ - 2 - m″
QDCS: m - 2 - m′ - 4 - m″

where m denotes the number of localized groups of original sound sources, m′ that of recorded localized images, and m″ that of reproduced localized images. One difference is that while the RM localization denoted by m′ may either represent real or imaginary sound images (i.e. via discs or tapes), with QDCS they are limited to real sound images. QDCS, therefore, works only with media which provide real images for m′, or exclusively with discs at the present time.

Ideal Recording Vectors Under QDCS

At this point it should be appropriate to take special note of the fact that localization of sound recorded on discs is as accurate as however close to straight-line vectors the disc cutting vectors had been. It is by the same principle as that governing reproduced sound which can be as accurately localized depending on however close it is to an in-phase relationship. Our experience with conventional stereo confirms truth of this principle, but expression by only two speakers is necessarily limited in localizing countless sound sources or reproducing the entire sound field. Besides, discs are not always cut in strict adherence to the principle, especially when special overall effects are desired.

However, if the same disc were subjected to detection along many different directions and then reproduced by the same number of speakers, the resultant localization of sound would be more accurate when the disc had been cut in full conformity with the foregoing principle. For such accurate recording of localization, the pair of signals fed to the disc cutter should ideally be in phase with or in opposite phase

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to each other. Other phase relations are used for recording or synthesizing indirect sound, and except where special unnatural effects are sought, phase shifting direct sound simply creates confusion in reproduced sound localization.

As long as phase relations of pairs of signals conform to this principle, countless localized sources can be recorded as motional vectors, each distinct from the others. In other words, cut disc recording makes it feasible to record all sounds as independent motional vectors, irrespective of the number of channels employed in sound pickup for the recording, although the more the channels used for pickup, the greater the percentage of direct sounds that are picked up, and so the more of localized sound sources that get accurately recorded. No direct connection, however, exists between the number of channels employed in sound pickup for recording and that used in detection or reproduction.

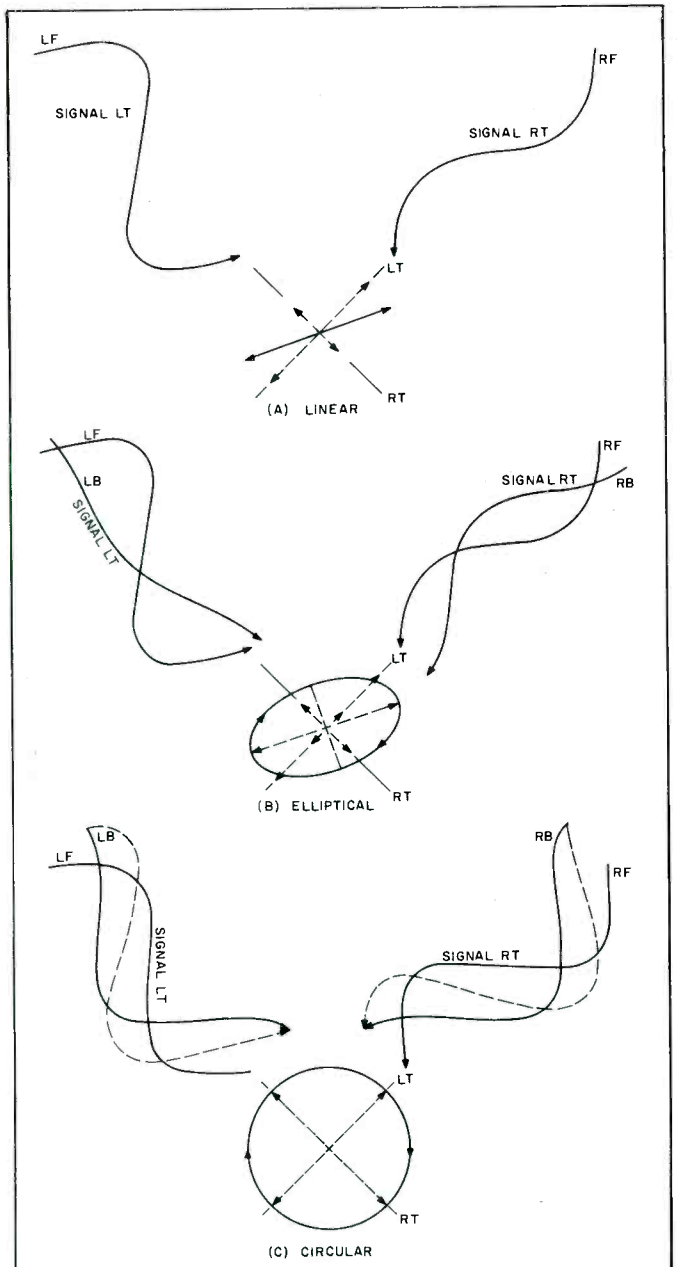

Fig. 19—Disc cutter input signals *vs.* recorded vectors embodying localizing information.

Actually, three types of disc cutting vectors represent direct sound localization, linear, elliptical, and circular motional vectors, as shown in Figure 19 (A), (B), and (C), but even the latter two, elliptical and circular, manifest themselves as pairs of in-phase linear motions when projected on detecting axes. These recording vectors, together with projections on detection axes and the resultant localization of reproduced sound, are illustrated in Figure 20 (A), (B), and (C). Musical information comprises plurality of these vectors which are further complicated by addition of indirect sound and other complex elements.

New Disc Recording of Natural Sound Fields—QDCS Recording

Heretofore, the usual RM recording technique relied on phase-shifting the rear channels only in order to reduce losses during two-channel transmission, but while no problem arises between LF and RF, or LB and RB, when signals from the same sound source are input to LF and LB or RF and RB, the cutter tip motion is no longer along a straight line axes, and thus a uniform utilization of the 360° tip motion is not accomplished.

Sound source S in Figure 21 (A) located between LF and RF gets picked up by microphones LF and RF, each signal decomposed into projections on LT and RT axes, and then again these vectors are recombined to form the original vector S, as shown in Figure 21 (B), which drives the cutter tip correctly. Similarly, sound sources in between LB and RB are correctly cut into discs.

However, as shown in Figure 22 (A), when the source is between LF and LB, LT and RT projections of LB which first passes through the phase shifter are shifted by 90°, and then vectorially added to LT and RT projections of LF, so that these do not form a linear motional vector, resulting in a non-linear motion of the cutter tip and incorrect sound localization. The same goes for sound sources between RF and RB.

In order to correctly recombine these vectors, firstly, pickup microphones should be arranged in a manner shown in Figure 23, and secondly, vectorical additions representing LT directions and vectorial subtraction RT directions as shown in Figure 22 (B), should be used for transmission after phase-shifting in a manner to avoid transmission losses as well as to eliminate crosstalk, thereby to correctly drive the cutter head.

Thus, sound sources located in the four quadrants, FL-FR, RF-RB, BR-BL, and LB-LF, are cut into discs in a mutually equal, uniform distribution of recorded vectors.

Crosstalk Eliminator

With cartridges with Figure 5 (A) ideal sensitivity distribution, signals picked up for the four independent channels from recorded discs need only be processed through a simple phase shifter to provide excellent reproduction. However, in the present state of art, only Figure 5 (B) approximation is feasible, so that further enhancement by electronic circuitry to reduce crosstalk is necessary to simulate Figure 5 (A) in overall performance. This electronic circuit is entitled "Crosstalk Eliminator" and its block diagram is shown in Figure 24.

This circuit differs from the usual logic circuits in that it involves no non-linear amplification and separation among channels is held constant.

The basic technique is to cancel crosstalk with the same signals in opposite phase, and does not involve such often-used methods incorporating variable parameters, as cancelling by simulated signals as practiced in logic circuits of matrix decorders, cancellations to accentuate predetermined peculiar

(Continued on page 54)

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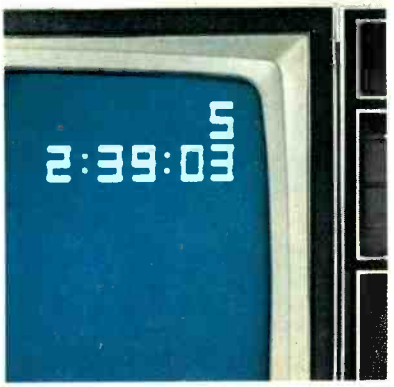

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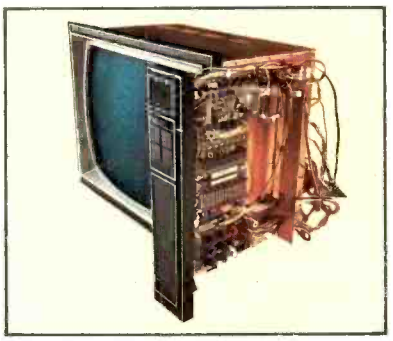

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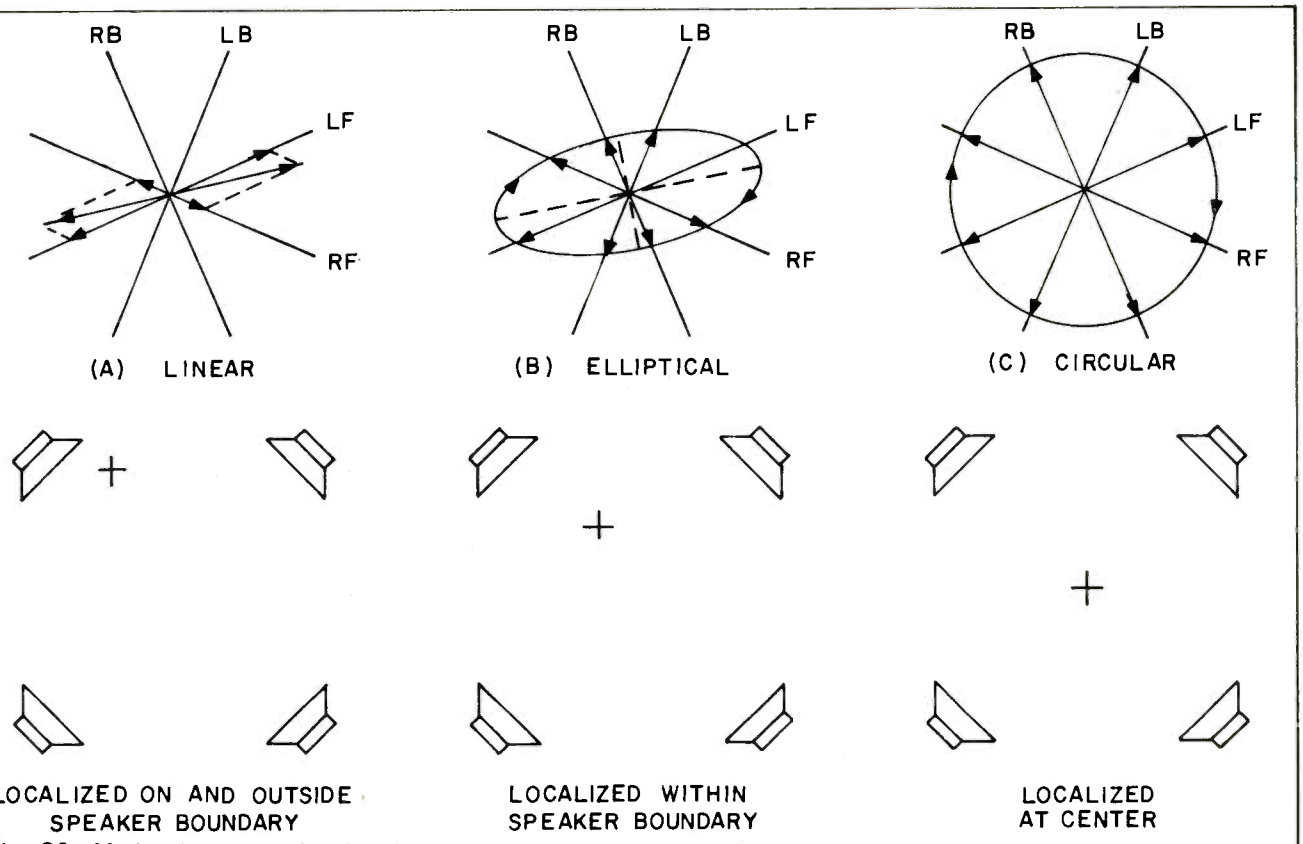

Fig. 20—Motional vectors of stylus tip and reproduced localization by QDCS.

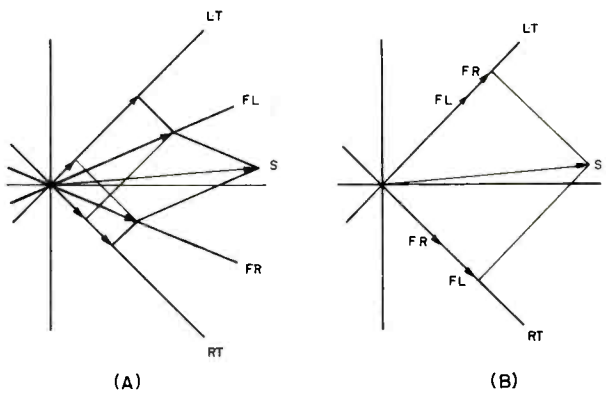

Fig. 21—Vectors by a front sound source.

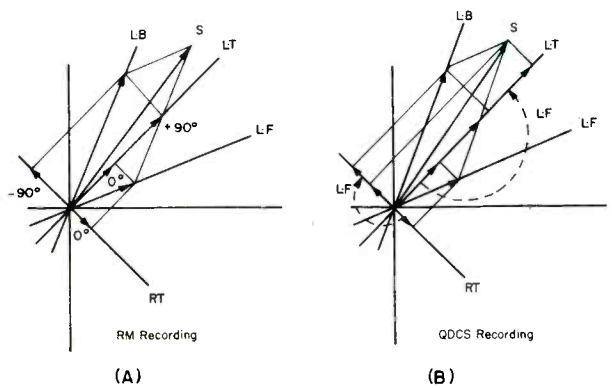

Fig. 22—Vectors by a left sound source.

(Continued from page 48)

spatial distributions of sound pressure, or separation enhancements by varying matrix parameters when under predetermined sound pressure distributions. Nor does it employ gain controls or other variables that are not part of the original sources, so that high fidelity in reproduction of sound pressure variations and localization of sound images are maintained at the same high levels as those of the two-channel stereo.

To describe the actual cancelling process, referring to Figure 25, definition of symbols used would first be necessary. Signals whose magnitude is expressed by the length of radial lines are also expressed in phase relationship by their radial angles to coincide with phase angles, where the counterclockwise direction is defined to be positive.

On this basis, the four-channel signals appearing at output terminals of the cartridge can be arranged to be expressed as in Figure 25 (A) where LF and RF are in phase, LB leads LF and RF by $+90°$, and RB lags behind LF and RF by $-90°$, in the same manner as is done under RM encording systems (for the sake of compatibility).

First, by letting front and rear signals be cancelled against each other in the left channels and also the right channels, main signals and opposite-phase crosstalk signals cancel out as shown in Figure 25 (B).

Next, by a similar process between left and right signals in the front channels and also the rear channels, remaining original crosstalk signals get cancelled out as shown in Figure 25 (C). Here, residual crosstalk and tertiary crosstalk generated by the secondary still remain, but their levels should be small enough to be negligible, and are not illustrated.

Generally, signals appearing at cartridge output terminals may be described as follows, where $\frac{1}{x}$ denotes the fractional rate of crosstalk from adjacent channels:

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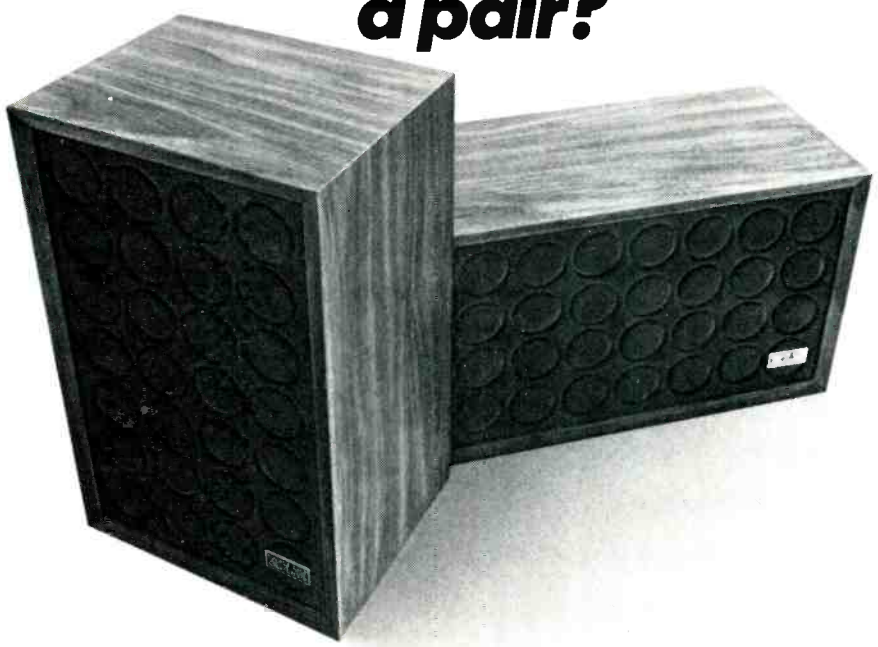

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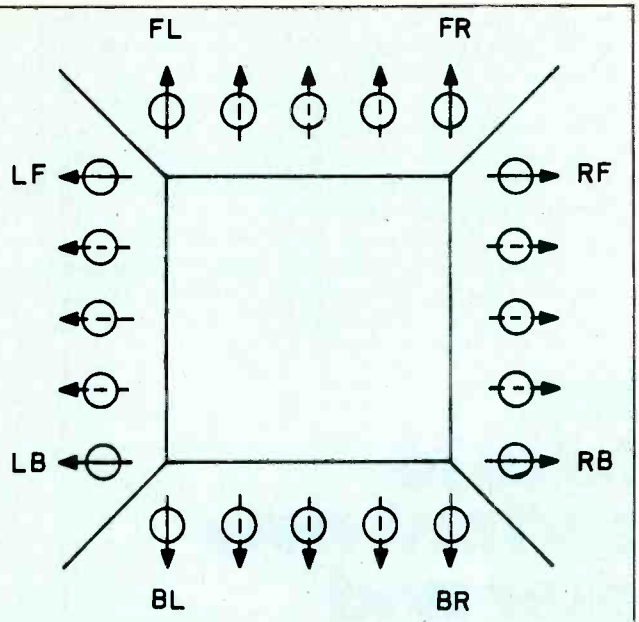

Fig. 23—Microphone setting for QDCS recording.

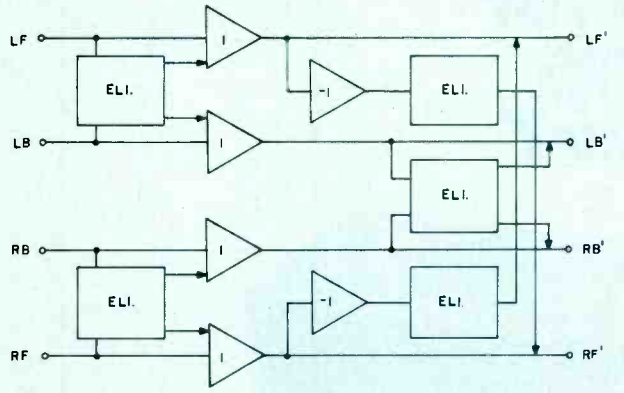

Fig. 24—Block diagram of "Crosstalk Eliminator."

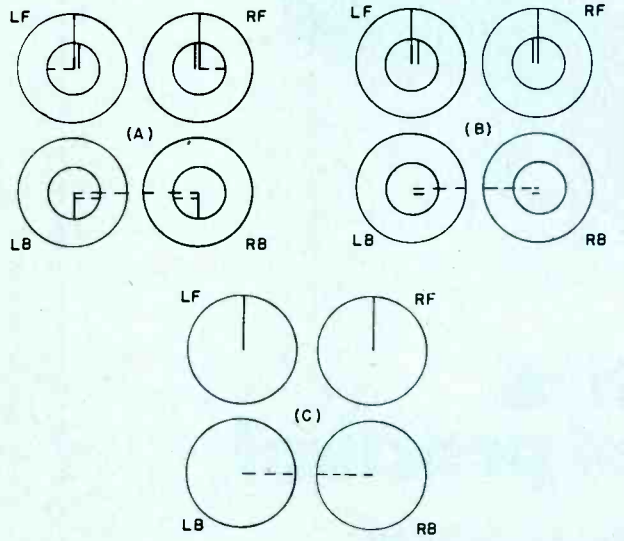

Fig. 25—Crosstalk cancelling process.

$$\begin{cases} LF = Lf + \frac{1}{4}Rf + \frac{1}{4}Lb \\ RF = Rf + \frac{1}{4}Lf + \frac{1}{4}Rb \\ LB = Lb + \frac{1}{4}Rb + \frac{1}{4}Lf \\ RB = Rb + \frac{1}{4}Lb + \frac{1}{4}Rf \end{cases}$$

By supplying $\frac{1}{x}$ times opposite-phase signals within the crosstalk eliminator, signals appearing at output terminals thereof may be described as follows:

$$\begin{cases} LF' = Lf + \frac{y-x}{xy-2}Rf + \frac{y-x}{xy-2}Lb - \frac{2}{xy-2}Rb \\ RF' = Rf + \frac{y-x}{xy-2}Lf + \frac{y-x}{xy-2}Rb - \frac{2}{xy-2}Lb \\ LB' = Lb + \frac{y-x}{xy-2}Rb + \frac{y-x}{xy-2}Lf - \frac{2}{xy-2}Rf \\ RB' = Rb + \frac{y-x}{xy-2}Lb + \frac{y-x}{xy-2}Rb - \frac{2}{xy-2}Lf \end{cases}$$

As expected, the greater the channel separation of cartridge, the more discrete will be the overall reproduction.

For example, if a cartridge outputs:

$$\begin{cases} LF = Lf + \frac{1}{4}Rf + \frac{1}{4}Lb \\ RF = Rf + \frac{1}{4}Lf + \frac{1}{4}Rb \\ LB = Lb + \frac{1}{4}Rb + \frac{1}{4}Lf \\ RB = Rb + \frac{1}{4}Lb + \frac{1}{4}Rf \end{cases}$$

and, if $\frac{1}{5}$ times opposite-phase signals are supplied within the eliminator, the resultant output therefrom will become:

$$\begin{cases} LF' = Lf + \frac{1}{11}Rf + \frac{1}{11}Lb - \frac{1}{11}Rb \\ RF' = Rf + \frac{1}{11}Lf + \frac{1}{11}Rb - \frac{1}{11}Lb \\ LB' = Lb + \frac{1}{11}Rb + \frac{1}{11}Lf - \frac{1}{11}Rf \\ RB' = Rb + \frac{1}{11}Lb + \frac{1}{11}Rf - \frac{1}{11}Lf \end{cases}$$

Solid Angle Recording and Detection, "QDCS Mark II"

Multichannel disc recordings should make full use of the cutters tip's ability of motion in any direction within the 360° angle around its stationary position, and QDCS MK I has been developed to achieve this goal.

However, closer review of recording methods brings us a step further to the realization that so far only such tip motions as within a given flat plane have been utilized by the above approach, and three-dimensional considerations have not been made.

Basically, vectors with up to two spatial directions can only constitute a single flat plane, but those with three or more directions can compose a solid angle. For effective utilization of three-dimensional tip motions, therefore, first consideration should be directed to the fact that front and rear

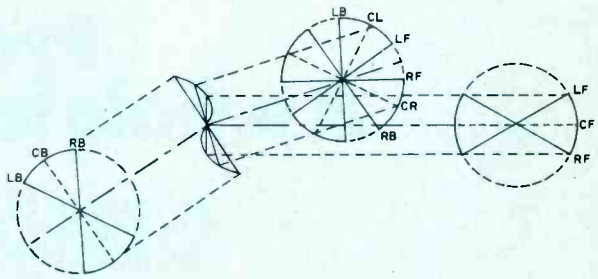

Fig. 26—QDCS MK. II: Three-dimensional disc cutting.

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The Technics SA-8000X demodulates or decodes any kind of 4-channel. Even some that haven't been invented yet.

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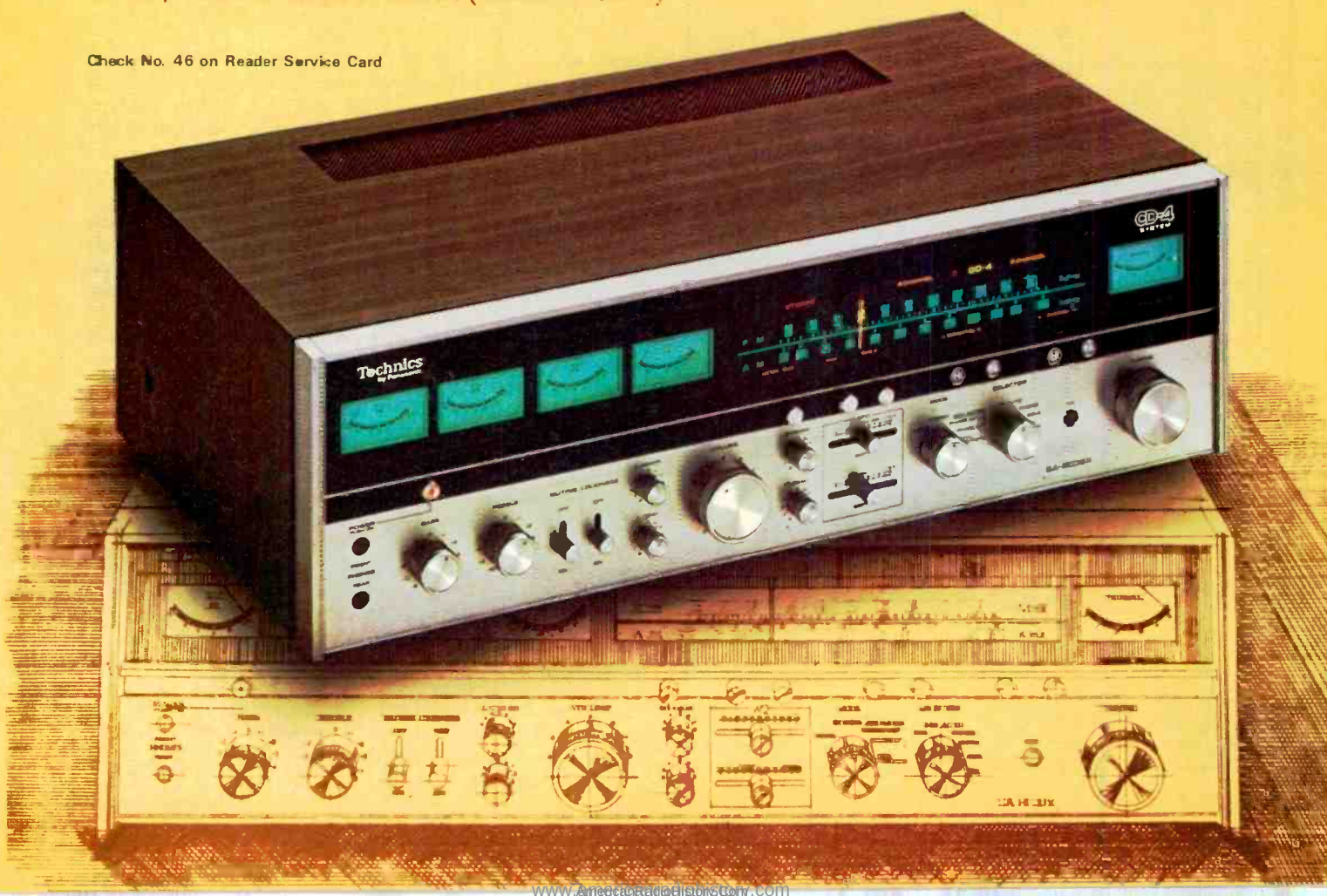

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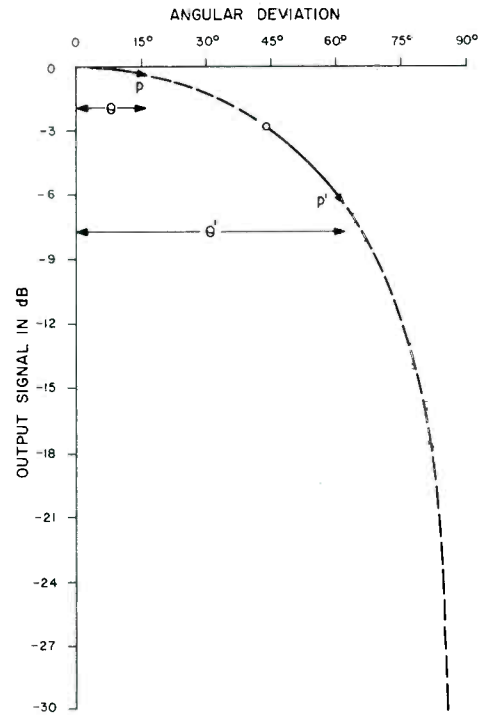

Fig. 27—Detection output *vs.* angular deviation between recording and detection axes.

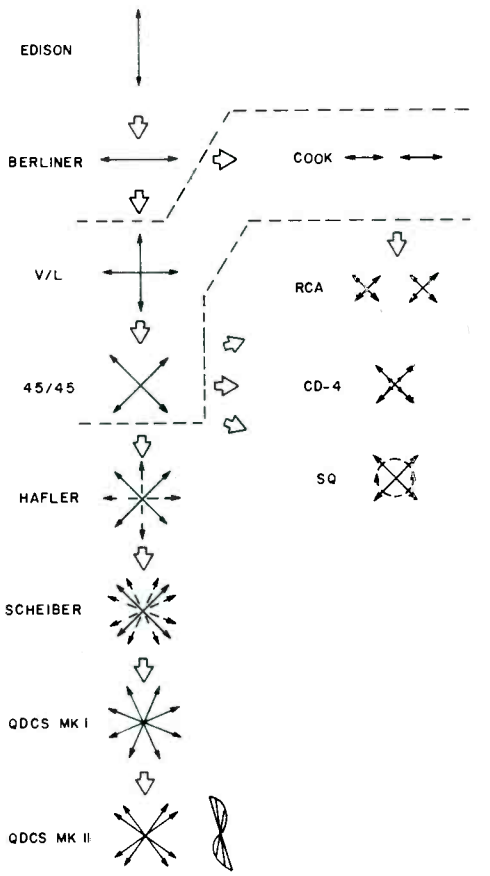

Fig. 28—Historical flow of recording developments as expressed by recording vectors.

channels border on axes horizontally (from left to right of the tip) symmetrical around the vertical tip axis. From this is suggested a three-dimensional format for one side of the border to include axes leaning toward the front and back of the tip, symmetrically around the vertical axis (for the sake of rationalism and compatibility with two-channel stereo and matrix systems).

It would be appropriate to assign these tilting angle vectors to rear channels that are under greater influence of vertical angles (gravity) than the front.

By incorporating in the cutter head such a front-rear angular driving mechanism as synchronizing with input cutting vector angles, distribution of actual cutting vectors can be broadened to encompass a three-dimensional solid angle. Assigning such broadened solid angles to appropriate recording channels (maintaining 90° angles between opposite channels for best results) enhances independence and separation of the channels, as compared with two-dimensional recordings. A representative distribution of such vectors is shown in Figure 26.

It follows that by incorporating in playback cartridges a mechanism responsive to the above, a greater channel separation should be attainable than when recording vectors are restricted within a two-dimensional flat plane.

Such playback cartridges should not only be effective for solid angle vector recordings, but also for conventional flat plane vector recordings in that an improved channel separation is attainable. The reason for this is that if in solid angle recordings the main signal vector were titled by an angle θ from that for flat plane recordings, and its crosstalk vector θ', these two angles would vary in the following ranges:

$$0 < \theta^\circ < 45^\circ, \qquad 45^\circ < \theta' < 90^\circ$$

These signals could be expressed as gain levels by shifting of points, p and p′ in Figure 27, so that as long as $\theta \leq \theta' 45^\circ$. The crosstalk level should invariably be reduced below the level when $\theta = 0^\circ$ and $\theta' = 45^\circ$.

Summary

By analyzing individually the two mutually perpendicular transmission axes employed in disc recording and the multiple radial transmission axes employed in disc reproduction, we have shown that while impossible with tapes, multi-channelization in the form of direct systems is feasible with discs which are the most appropriate media for this purpose.

Secondly, we propose this QDCS system as the solution for the self contradiction and imperfection inherent in conventional two-channel disc systems as have been pointed out through analysis of properties of discs and ideal reproduction thereby.

Under these philosophies, we have also derived from correlation of sound pickup procedures and disc cutting vectors that the 4-2-4 effect, hitherto considered to be purely accidental, really has a theoretically sound basis.

From the foregoing we have introduced and described the QDCS disc cutting principle which is a balanced redistribution of the signals that are fed along the two transmission axes in recording.

To fulfill all of the foregoing leads to a simultaneous solution for compatibility and the sound field structure.

As a final summation, the relationship between conventional cut disc recording systems and QDCS MK I & MK II is shown in Figure 28.

This system, we believe, should be appraised by the fact that originally anticipated in Figure 1, it has finally materialized in the form shown in Figure 28.

Lastly it should be added that further development with QDCS as the basis is presently under way for still newer systems with a broader application. Æ

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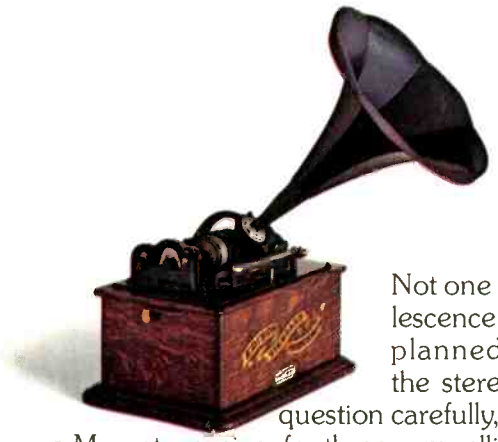
I bought a Marantz 4 channel receiver because I refuse to be stuck with an electronic antique.



Not one to tolerate obsolescence (planned or unplanned), I considered the stereo vs. 4-channel question carefully, then purchased a Marantz receiver for three compelling reasons.

One. Marantz has Dual Power. This means you get full power of four discrete amplifiers working all the time. When you're listening to regular 2-channel tapes and records you can combine the power of all four channels into the front speakers. This means even if you're not ready to commit yourself to a complete 4-channel system, you can buy Marantz now and when you get the other two speakers just flip a switch. You have 4-channel. Meanwhile, you're not compromising 2-channel because you're getting more than twice the power for super stereo.

Reason number two. Marantz receivers feature the exclusive snap-in snap-out adaptability to any 4-channel matrix decoder. This means that your Marantz stereo will never be made obsolete by any future 4-channel technology because the Marantz snap-in SQ* module is designed to keep up with the changing state of the art. What's more, Marantz receivers have Vari-Matrix—a built-in circuit that will synthesize 4-channel sound from any stereo source (including your stereo records and tapes) and will also decode any matrix encoded 4-channel disc or FM broadcast.

Reason number three. Marantz receivers, from the Model 4230 up, feature built-in Dolby** noise reduction to bring you the quietest FM reception ever. And you can switch the built-in Dolby into your tape deck for noise-free, no-hiss recording from any source. A real Marantz exclusive.

I chose the Marantz Model 4270 because it suits my needs perfectly. It delivers 140 watts continuous power with under 0.3% distortion. And it's literally loaded with features. However, your requirements may be more modest than mine. In which case you can own the Marantz Model 4220 which delivers 40 watts with Dual Power. Or you can go all the way and get the Marantz Model 4300 with 200 watts. It is the very best. Choose from five Marantz 4-channel receivers from $299 to $899.95.

The point to remember is this—whichever model Marantz 4-channel receiver you do buy, you can buy it today without worrying about its being obsolete tomorrow. Look over the Marantz line of superb quality receivers, components and speaker systems at your Marantz dealer. You'll find him listed in the Yellow Pages. Think forward. Think Marantz.

marantz.
We sound better.

*SQ is a trademark of Columbia Broadcasting System, Inc.
**TM Dolby Labs, Inc.

©1973 Marantz Co., Inc., a subsidiary of Superscope Inc., P.O. Box 99A, Sun Valley, Calif. 91352. In Europe: Superscope Europe, S.A., Brussels, Belgium. Available in Canada. Prices and models subject to change without notice. Consult the Yellow Pages for your nearest Marantz dealer. Send for free catalog.

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Equipment Profiles

Pilot Model 366 Four-Channel Receiver

MANUFACTURER'S SPECIFICATIONS

FM TUNER SECTION:

IHF Sensitivity: 1.8 μV. **S/N**: 65 dB. **THD**: (Mono), 0.4%; Stereo, 0.8%. **Selectivity**: 65 dB. **Capture Ratio**: 1.5 dB. **IF Rejection**: 90 dB. **Image Rejection**: 80 dB. **Spurious Response Rejection**: 90 dB. **Stereo Separation**: 36 dB @ 400 Hz.

AM TUNER SECTION

IHF Sensitivity (Internal Antenna): 200 μV. **Selectivity**: 35 dB. **S/N**: 45 dB. **Image Rejection**: 60 dB. **IF Rejection**: 60 dB. **Bandwidth** (—6dB): 7 kHz.

AMPLIFIER SECTION:

Power Output: 60 watts per channel, Stereo Mode; 30 watts per channel, 4-channel mode, continuous power at 1 kHz. **Rated THD**: 0.5%. **Rated IM**: 0.5%. **Power Bandwidth**: 10 Hz to 40 kHz. **Frequency Response**: High Level: 15Hz to 25kHz± 1 dB. **Damping Factor** (8-ohms): 35. **Input sensitivity**: Phono 1 & 2, 2.5/4.5 mV; High Level, 250 mV; Microphone, 1 mV. **Tape Output**: 350 mV.

GENERAL SPECIFICATIONS:

Dimensions: 7 in. H x 18½ in. W x 17½ in. D. **Power Requirements**: 120 V 50/60 Hz. **Weight**: 44 lbs. **Price** (Includes walnut enclosure): $499.90.

The Pilot 366 4-channel receiver is a large, imposing unit, laden with control features and control flexibility which will appeal to the audiophile who wants quadraphonic sound mixed in with a bit of a recording facility. We're referring to the fact that in addition to the features you would expect, the Model 366 has a pair of microphone inputs located right on the front panel, above which is a dual level control knob which enables the user to "mix" mic or instrument inputs together with any other program source. Unfortunately, the mixing control affects both mic inputs, thereby limiting its flexibility. As for the front panel, it is black epoxy-coated aluminum, screened with white letters of good, readable size and equipped with silver colored knobs and pushbuttons. Major front panel controls include a SELECTOR switch (with two PHONO and two AUX positions plus AM and FM), a five-position mode switch (MONO, STEREO, MATRIX-4, SQ and DISCRETE), separately operated dual-concentric clutch type BASS and TREBLE controls, a pair of BALANCE controls (front-back and left-right), also clutch operated for individual channel balance, and a master VOLUME control. There are twelve push buttons for secondary control functions such as LOW and HIGH FILTERS, TAPE MONITOR, LOUDNESS, MUTE, speaker NORMAL-REVERSE (which affects rear speakers only), speaker selector switches for MAIN and REMOTE (duplicated for stereo power mode or quadraphonic power mode) and a POWER on/off push button. The previously referred to MIC level control and input jacks are located at the lower left of the panel while a matching pair of PHONE jacks are symmetrically located at lower right. Upon application of power, the upper portion of the panel is illuminated either by a single word, denoting selector switch position or, in the case of AM or FM selection, by a green dial scale and a yellow pointer tip. At the left of this portion of the dial are two meters, a center-of-channel meter which is illuminated only when FM listening is selected and a signal strength meter, illuminated during AM listening. This area of the panel also has illuminated lights to tell the user whether the mode switch is in mono, stereo or 4-channel settings. In our view, the separate buttons for two-speaker and four-speaker mode (with "double power available in stereo") is a bit confusing, though not dangerous, for Pilot's instruction manual cautions against pushing, say, a "main speaker" button for both 2-channel and 4-channel operation at the same time! These buttons would

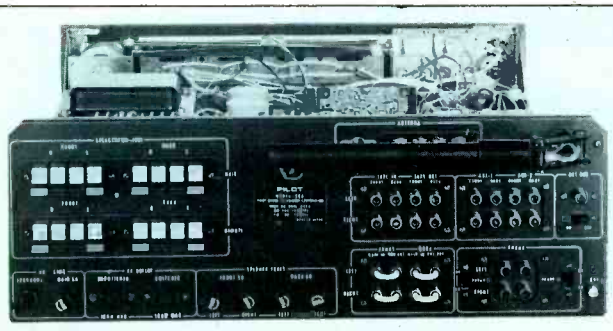

Fig. 1—Rear panel layout.

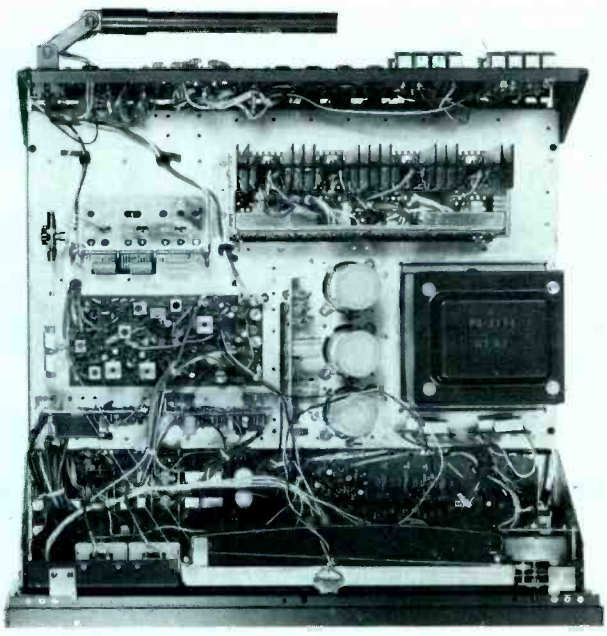

Fig. 2—Internal chassis layout.

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have been better off combined as a single rotary selector switch, much as other manufacturers of "strapped" four-channel receivers have done.

Figure 1 is a view of the rear panel layout of this receiver. Sixteen black and red color coded spring loaded terminals make speaker connections simple. Stripped wire ends are merely inserted in holes that are accessible when each button is depressed and are firmly retained in place when the button is released—no twisting or turning of screws required. In addition to screw-type antenna terminals for 300 ohm FM and external AM antennas, there is provision for a coaxial connector for 75 ohm FM transmission lines. Each pair of phono inputs is accompanied by a slide switch which varies phono input sensitivity from 2.5 mV to 4.5 mV. Jumpers installed in four pairs of PHONO jacks permit separation of each preamplifier channel from its associated main amplifier section. Sixteen additional phono jacks take care of AUX 1, AUX 2, TAPE IN and TAPE OUT circuits. (It's amazing how the number of jacks multiplies when you double everything for four-channel applications!) An FM detector output jack is located at the extreme right of the rear panel, and there is a switch which turns off this facility (for the next couple of years until discrete FM broadcasting begins) and we are at a loss to understand why this jack must be disconnected when not used, since it is simply a connection point to the FM detector output. In fact, we could detect no difference in FM performance with the switch "on" or "off." Four speaker line fuses, a power line fuse, a switched and unswitched convenience a.c. receptacle, a ground terminal and the usual ferrite bar AM antenna complete the rear panel arrangement.

A view of the internal layout of the Pilot 366 chassis (Fig. 2) discloses that it is constructed of individual p.c. board modules, although there seems to be an inordinate amount of interwiring required. The sealed and shielded front-end utilizes a four-section variable capacitor for FM and a three section unit for AM. Three dual-gate FET's are used in the circuitry of the FM front-end. The relatively small i.f.-MPX module contains three IC's in the FM i.f. section as well as ceramic filters. An IC does most of the job of stereo decoding as well, while the AM circuitry consists of bi-polar transistor circuits. Preamplifier, voltage amplifier and tone control stages are constructed using conventional circuitry and separate transistors rather than IC's while NPN power output transistors are powered by dual positive and negative 33 volt supplies, eliminating the need for coupling capacitors between outputs and speakers. The SQ decoder module employs minimal phase shift networks, which are switched out of the circuit when the MATRIX-4 decode position is selected. This setting is recommended by Pilot for listening to conventional stereo records and extracts ambience or out-of-phase information in the now familiar way. A novel additional circuit is a locally-generated 1 kHz oscillator which is used as a test signal to balance sound levels from all four speakers. A central PILOTONE button, not previously mentioned, is located on the front panel for this purpose. This test signal presumes that program sources as well as internal amplification in the receiver, are equal, which may or may not be the case. Power supply voltage is obtained by means of a bridge rectifier arrangement with 6800 mfd capacitors used for primary filtering of both negative and positive output stage voltages. Each basic amplifier section has a differential amplifier stage as an input and coupling is direct from this stage to output transistors.

Tuner Section Measurements

IHF sensitivity in FM, as measured on our sample, was exactly 1.8 μV as claimed. A 50 dB S/N ratio was obtained with an input signal of only 3 μV, but ultimate S/N was 63 dB in mono, as opposed to the 65 dB specified. Both mono and stereo THD were considerably better than claimed by the manufacturer, measuring 0.2% and 0.4% respectively, at mid-frequencies of audio modulation. Results of these measurements are plotted in Fig. 3. Muting and stereo switching threshold occurred at an input signal strength of about 10 microvolts. For stereo reception, ultimate S/N was 63 dB, a value obtained for all input levels above about 100 microvolts.

Stereo FM separation and distortion versus frequency in FM are plotted in Fig. 4. At mid-band frequencies, separation exceeded manufacturer's claims by roughly 3 dB, measuring 39 dB. Separation decreases gradually to about 30 dB at 100 Hz and 27 dB at 10 kHz—figures which are more than adequate for this parameter. Mono THD remains less than 0.5% for all frequencies from 50 Hz to 4 kHz rising to an acceptable 0.7% at high audio frequencies. Stereo THD hovers around the 0.5% mark until "beats" appear at higher frequencies, resulting in a spurious output reading of about 2.3% at 5 kHz. Selectivity measured 65 dB as claimed, while capture ratio fell a bit short of published claims, measuring 1.8 dB. Spurious response rejection measured 93 dB, a bit better than claimed, while i.f. and image rejection conformed almost exactly with Pilot's published specifications. The AM section proved to be quite good, with sensitivity reading of 150 μV as opposed to the 200 μV claimed. Using an external dummy antenna, sensitivity was just under 20 microvolts, while selectivity measured 38 dB.

Amplifier Measurements

In the four-channel mode, maximum continuous power output obtained for rated THD (0.5%) equalled 28 watts per channel. At the rated value of 30 watts per channel,

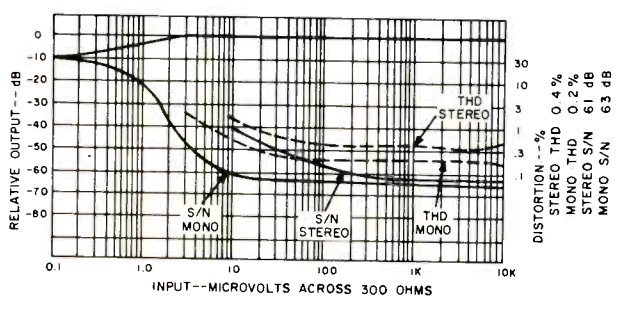

Fig. 3—FM quieting and distortion characteristics.

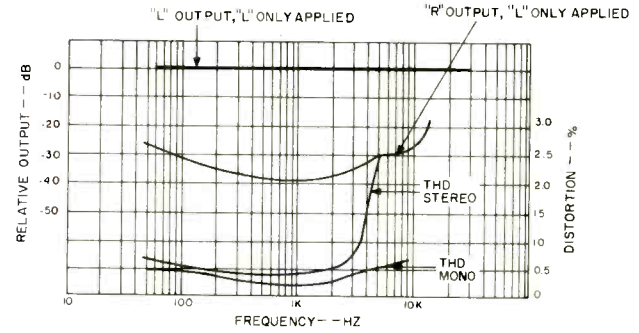

Fig. 4—Separation and distortion vs. frequency.

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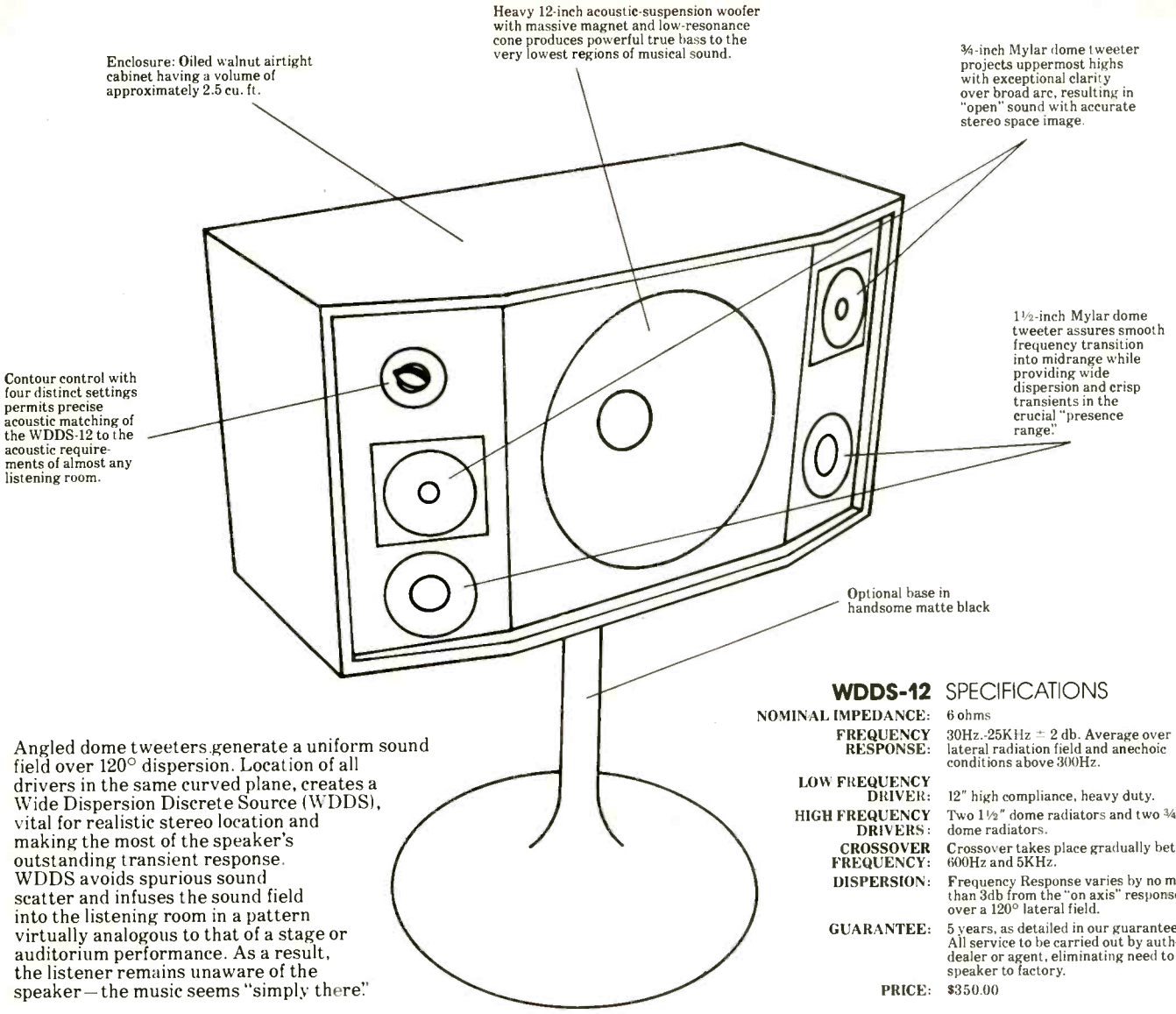
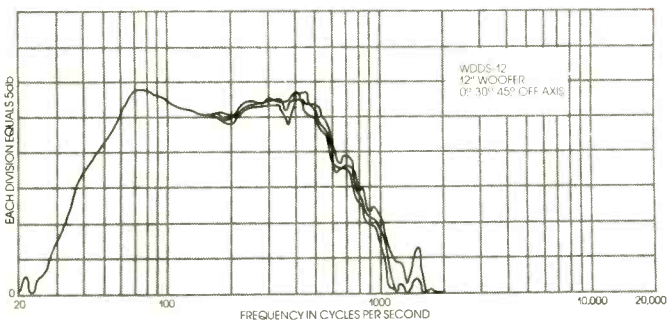


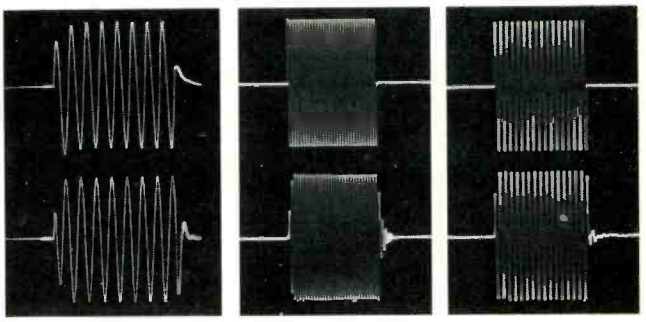
Angled dome tweeters generate a uniform sound field over 120° dispersion. Location of all drivers in the same curved plane, creates a Wide Dispersion Discrete Source (WDDS), vital for realistic stereo location and making the most of the speaker's outstanding transient response. WDDS avoids spurious sound scatter and infuses the sound field into the listening room in a pattern virtually analogous to that of a stage or auditorium performance. As a result, the listener remains unaware of the speaker—the music seems "simply there."

WDDS-12 SPECIFICATIONS

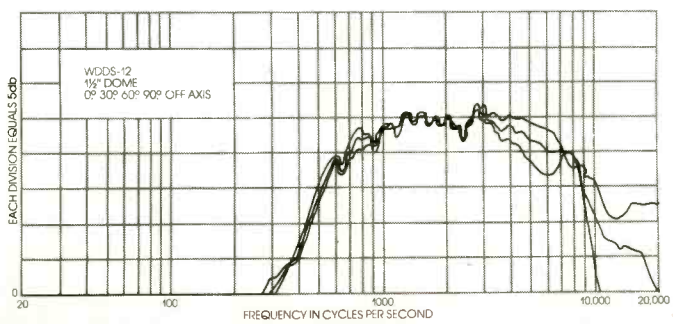
NOMINAL IMPEDANCE:	6 ohms
FREQUENCY RESPONSE:	30Hz.-25KHz ± 2 db. Average over 120° lateral radiation field and anechoic conditions above 300Hz.
LOW FREQUENCY DRIVER:	12" high compliance, heavy duty.
HIGH FREQUENCY DRIVERS:	Two 1½" dome radiators and two ¾" dome radiators.
CROSSOVER FREQUENCY:	Crossover takes place gradually between 600Hz and 5KHz.
DISPERSION:	Frequency Response varies by no more than 3db from the "on axis" response over a 120° lateral field.
GUARANTEE:	5 years, as detailed in our guarantee form. All service to be carried out by authorized dealer or agent, eliminating need to return speaker to factory.
PRICE:	$350.00



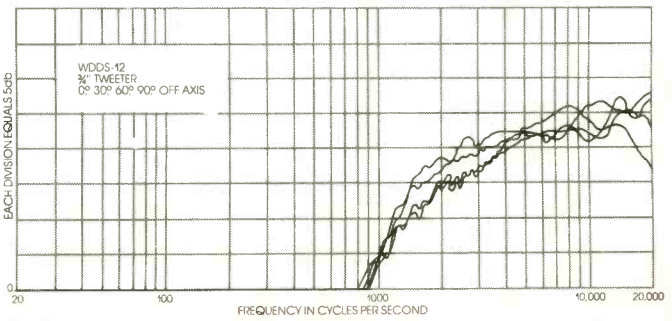
Woofer response, on and off axis, shows effective output below 30Hz, reaching the lowest range of musical sound.



Woofer tone burst at 45Hz and supertweeter tone burst at 16 and 4 kHz attest remarkable clarity of transients throughout audible spectrum.



Tweeter response curves on and off axis almost coincide, proving uniformity of sound spread in listening space.



Supertweeter response curves off axis also closely parallel on-axis response, showing superior sound dispersion.

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Introducing the WDDS-12 Pritchard Loudspeaker System

More confusion?

There are literally hundreds of speakers on the market. There are 2-way systems, 3-way systems, omnidirectional, rearward sound projection, et al. All, according to their makers, are outstanding. And, frankly, several are.

Small wonder the public is confused. And good reason why serious listeners rely on expert opinions, as well as recommendations from knowledgeable equipment owners.

Our new Pritchard system will surely add to the confusion. And our claims will fall, unfortunately, on many deaf ears.

But among those people who, over the years, have learned to separate fact from fiction...who trust their own ears...and who respect "inside" opinions, this new speaker will be a revelation.

If you're a serious listener, unfamiliar with ADC speakers, we urge you to talk to people familiar with our products. They know that, among the relatively few outstanding speaker systems on the market, ADC's line ranks among the best. And, now, with the introduction of the Pritchard System, ADC's probably number one!

For most, the confusion about speakers will continue. For some, the WDDS-12 Pritchard System will shout "hello."

ADC speakers -the insider's choice.

AUDIO DYNAMICS CORPORATION, Pickett District Road, New Milford, Conn. 06776

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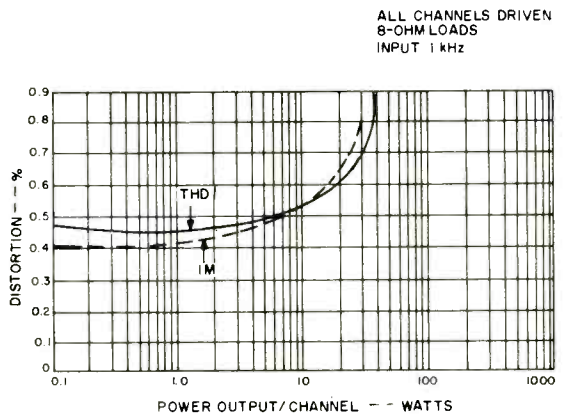

Fig. 5—Harmonic and intermodulation distortion characteristics.

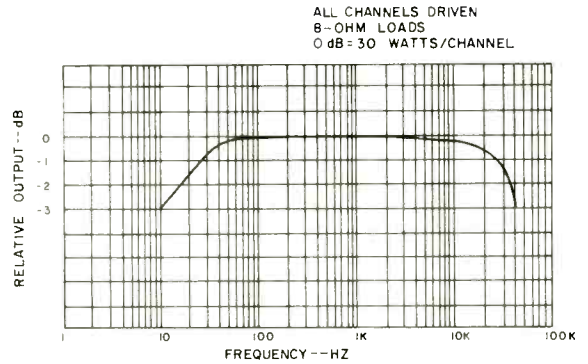

Fig. 6—Power bandwidth characteristics.

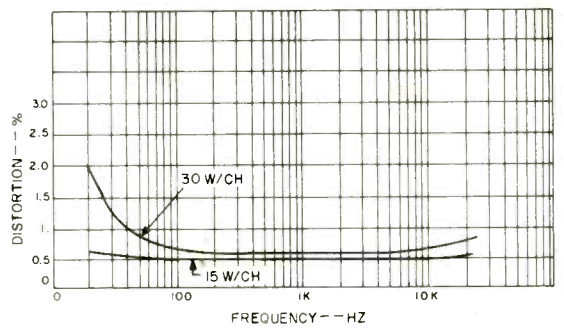

Fig. 7—Distortion vs. frequency.

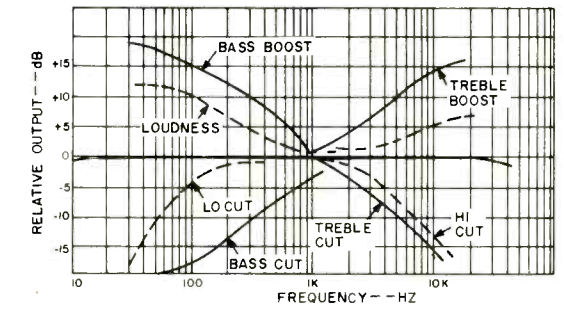

Fig. 8—Tone control range, filter and loudness characteristics.

THD was 0.7%. IM distortion measured 0.8% at rated output under the same conditions. Distortion at lower power levels remained at or near 0.5%, while IM decreased to roughly 0.4% for lower power output levels. These values are plotted on a continuous basis in Fig. 5. It should be noted that no plot is made for the strapped condition (stereo operation), however, results were essentially the same using a reference of 60 watts continuous power per channel. All readings were taken with all channels driven into 8 ohm loads.

Power bandwidth, plotted in Fig. 6, extends from 10 Hz to 40 kHz as claimed. It should be noted however that the 0 reference point in this plot is 30 watts per channel and since actual power output for rated THD is slightly lower than 30 watts, mid-band points on the curve also fall below the 0 dB reference. If Pilot had chosen to rate the unit more conservatively (say, 25 watts per channel), power bandwidth on that basis would have extended somewhat beyond the limits of 10 Hz and 40 kHz.

If the amplifier section of the Model 366 is driven to 30 watts at 20 Hz, THD rises to about 2%, as shown in Fig. 7. At half power, however, distortion remains fairly constant over the entire audio spectrum. Action of preamplifier section controls is plotted in Fig. 8. Bass boost action is a bit extreme and this control should therefore be used in moderation to avoid overloading the amplifier at low frequencies. The low frequency filter has a slope of 12 dB per octave, while the high-cut filter behaves much like the treble cut control, at a slope of only 6 dB per octave. Loudness-contour (measured at 30 dB below maximum volume control setting) is typical of this circuit and Pilot's designers have chosen to emphasize treble as well as bass when the loudness control is activated, though the treble boost is more moderate as it should be.

Listening Tests

In the course of listening to the Pilot 366, we discovered and used a couple of additional features which we had not noticed up to that point. For example, the illuminated pointer, we found, changes color from yellow light to red light when a station is precisely tuned in on FM. It takes a fairly strong signal to make the light color change, however, and under those circumstances, the "window" of color change is fairly broad and we still preferred setting accurate tuning by means of the center-of-channel meter. Still, it's an interesting feature. We also found that the MATRIX-4 setting of the mode switch worked well with some stereo discs but worked to our satisfaction even on some quadraphonic-encoded discs—sometimes better than when the same discs were played in the SQ position.

The built in SQ decoder circuit in the Pilot 366 is the simple non-logic type and in certain instances this type of SQ decoding results in some ambiguities, particularly when a "stage front and center" soloist is involved in the recorded performance. It was with such recordings that we found the MATRIX-4 setting to be more effective than the SQ setting.

Power output of the receiver was adequate for medium-low efficiency speakers in the four-channel mode. Power capability seemed noticeably better when we hooked up only a pair of stereo speakers and treated the receiver as a two-channel unit. We're well aware of the fact that the difference in power output under those circumstances is only 3 dB and that it should have been "barely noticeable" but we can only report on what we heard. Perhaps that three dB made the difference between bass distortion and clean bass at the levels we used in our tests.

For those interested in adding CD-4 demodulator equipment to this receiver, the fact that there are a pair of AUX inputs

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The best of both worlds– PICKERING'S STATE-OF-THE-ART CARTRIDGES...

Pickering has done it again! In 1957—the *first* American-made magnetic stereo cartridge that helped build the industry was a Pickering. Now—in 1973—the *first* American-made discrete, 4-channel cartridge that will change the world's listening is a Pickering. Today, Pickering invites you to enjoy the *best* of the world of your choice.

For the world of STEREO– XV-15/1200E

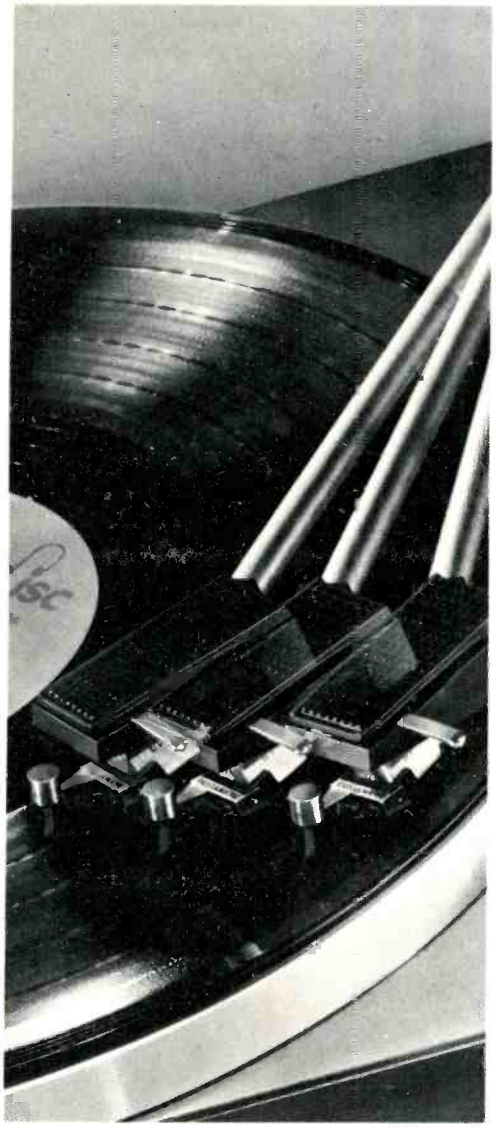
Designed for use with all stereo and four-channel derived compatible systems.

"PRECISION" is the one word that best characterizes the extraordinary quality of the new Pickering XV-15/1200E cartridge, the culmination of Pickering's 25 years in contributing important technological advances to the manufacture of magnetic cartridges. We sincerely feel that the 1200E is the furthest advance achievable today—and perhaps in the foreseeable future—in stereo cartridge design and performance. Its exceptional ability to pick up *all* the material recorded at the lightest possible tracking forces make it totally unique and superior. This cartridge is for the sophisticate—one who possesses components of such superlative quality that the superiority of the XV-15/1200E is a requirement.

And all of Pickering's exhaustive testing shows that the 1200E is superior in the flatness of its frequency response and channel separation in comparison to competitive cartridges.

SPECIFICATIONS

Frequency Response:	10 Hz to 30 kHz
Channel Separation, Nominal:	35 dB
Tracking Force:	¾ gram, +½ gram, −¼ gram.
Nominal Output:	4.4 mv
Stylus Tip:	0.0002" x 0.0007"



For the world of DISCRETE 4-CHANNEL– UV-15/2400Q

QUADRAHEDRAL™

Designed and engineered specifically for playback of discrete recordings.

The introduction of the discrete 4-channel system required a completely new cartridge that could not only faithfully reproduce the 20 Hz to 20 kHz AM signals, but also the 30 kHz FM modulated signals. The result is the Pickering UV-15/2400Q discrete 4-channel cartridge, which represents a new level in the state of the art. It consists of a completely redesigned cartridge and a new high performance stylus assembly, the Quadrahedral™, which was specially developed for this application, and features a revolutionary new diamond stylus. The UV-15/2400Q performs in a superior manner by every measurable test, and is capable of satisfying all the technical and aesthetic requirements for playback of all the material recorded on both discrete and stereo disks. Moreover, its stylus is so designed that it not only perfectly reproduces the music recorded, but also reduces record wear.

SPECIFICATIONS

Frequency Response[2]:	10-50,000 Hz
Channel Separation:	35 db
Tracking Force[1]:	1-3 grams
Output[3]:	3.8 mv ±2 dB
Stylus:	Quadrahedral

Notes:
1. Recommended by manufacturer for optimum performance.
2. When the cartridge is terminated in the recommended load of 100K ohms and 100 PF.
3. Output with reference to 5.5 cm/sec record velocity.

The right Pickering cartridge for your equipment is the best cartridge money can buy.

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available in a convenience and permits you to hook up a CD-4 demodulator without having to disconnect your tape recorder or other high level program source.

FM reception was acceptable, and we were favorably impressed with the positive action of the muting circuits. There was no audible transition noise as stations were approached when the muting circuit was in use. The threshold point (10 microvolts) chosen by Pilot seemed right for a tuner of this sensitivity as well, though we were able to listen to three or four stations with acceptable quieting with the mute defeated that would have otherwise not been received.

Under $500 is what you would normally expect to pay for a stereo receiver with 60 watt per channel capability. The fact that Pilot is able to offer that "dollars per watt" ratio and quadraphonic capability with built in decoding facilities as well makes the Pilot 366 worth a second look.

Leonard Feldman

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Nakamichi Tri-Tracer 1000 Cassette Recorder

MANUFACTURER'S SPECIFICATIONS

Wow and Flutter: Less than 0.10% (DIN). **Frequency Response**: 35 to 18,000 Hz ± 3 dB, Low Noise Tape; 35 to 20,000 Hz ± 3 dB, CrO_2 tape (both using Dolby). **Signal-to-Noise**: Better than 60 dB (DIN), Dolby, weighted at 3% distortion. **Total Harmonic Distortion**: Less than 2%, 0 VU, 1 kHz. **Channel Separation**: Better than 35 dB, 0 VU, 1 kHz. **Bias Frequency**: 105 kHz. **Headphone Output**: 3 mW. **Dimensions**: 20.7 in. W x 11.7 in. H x 8.6 in. D. **Price**: $1,100.00.

The Nakamichi 1000 must surely be considered the Rolls Royce of cassette recorders with its two noise reduction systems (Dolby and Philips DNL), variable speed, separate record head with monitoring facilities, IC logic control, and a host of other features. It is intended for professional users but it will obviously appeal to many enthusiasts who want state-of-the-art performance—and can afford the $1100! The unit is housed in a wooden case for vertical operation but it is available for rack mounting if desired. At the left is the cassette compartment and just above that is a hinged door covering the speed control and head alignment controls (see Fig. 2). Adjustment is simplicity itself and it works like this: A built-in oscillator or generator supplies a 400 Hz signal which is recorded on the tape. Output from the recording and playback heads is taken via a phase-comparison amplifier to two LED indicator lamps called alignment beacons. All the user has to do is turn an adjustment control so that the lights are balanced. The control affects only the record head. In other words, it is matched to the playback head which is aligned at the factory. There is an azimuth adjustment for this head and it can be checked with a standard test tape if necessary. Incidentally, tape motion is from right to left and the heads are mounted above the tape. The tape speed control gives a variation of ± 6% in playback only and it is labelled PITCH CONTROL.

Under the cassette compartment are six touch-control buttons labelled PAUSE, RECORD, F. FORWARD, REWIND, STOP, and PLAY and each one has an indicator light. To the right of these controls is a small panel on which is mounted the tape counter, EJECT button, AUTO REW and MEMORY rewind switches plus a headphone jack. The MEMORY rewind switch allows the tape to be wound back to a preset point and the AUTO REW switch will automatically ensure that the tape will be rewound at the end of the tape—a useful device! At the top right are the two large VU meters (peak reading), and underneath them are switches for TAPE SELECTION (NORMAL and CrO_2), LIMITER, DOLBY and DNL noise reduction and tape-source MONITOR. To the right is the ON/OFF switch and three MIC INPUT sockets—one for each channel and one for center, or BLEND. To the left of these

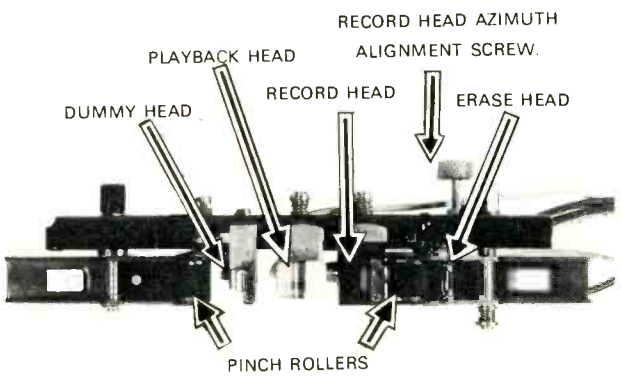

Fig. 1—Head configuration.

Fig. 2—Showing compartment containing speed and head alignment controls.

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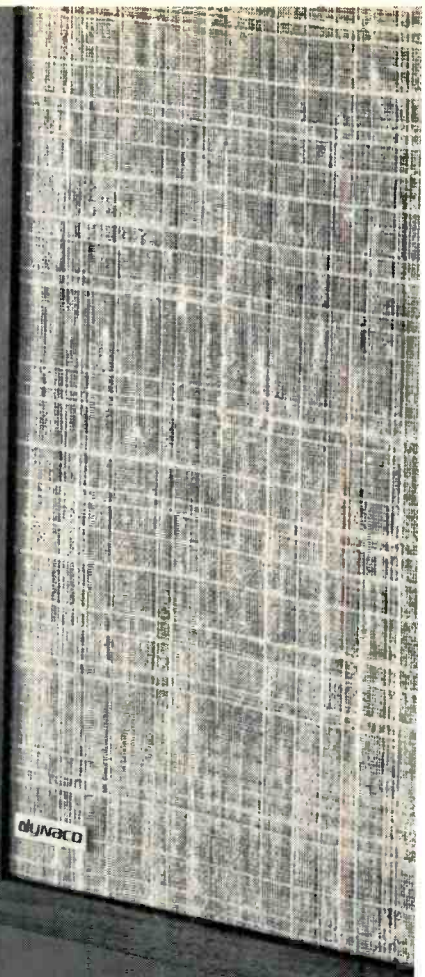

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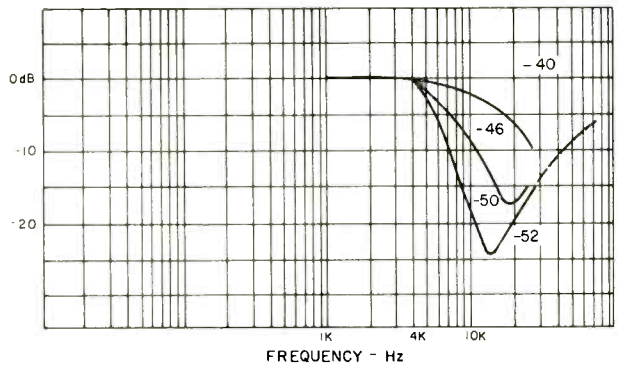

Fig. 3—Showing operation of the DNL noise reduction system.

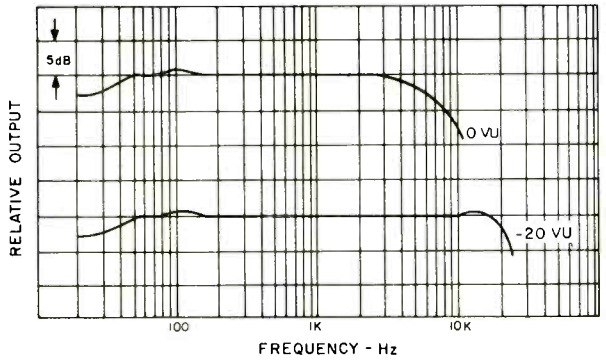

Fig. 4—Record-replay response with Nakamichi CrO_2 tape.

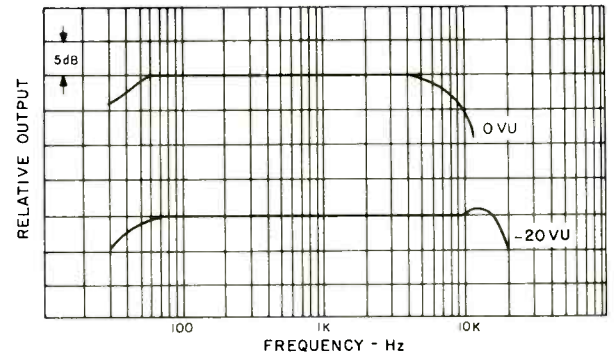

Fig. 5—Record-replay response with low-noise tape.

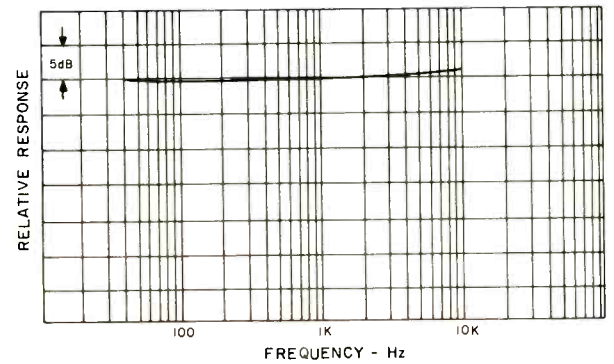

Fig. 6—Response from standard playback tape.

are twin slide controls for OUTPUT, LINE INPUT, and MIC INPUT and a single one for the BLEND MIC position. Finally, at the top center is an illuminated tape run indicator. At the rear are the input and output sockets, test-tone level control and calibration controls for both CrO_2 and NORMAL tapes. There are also two DIN sockets (one for stereo mic) and an MPX switch that cuts response above 18 kHz to prevent the FM 19 kHz carrier from interfering with Dolby operation and—I almost forgot—a socket for a remote control unit.

Model 1000 employs no less than 138 transistors, 59 diodes and 8 ICs. A very complex logic circuit is used for precise control to ensure foolproof, effortless operation and freedom from click noise. Thus, if you want to record when the machine is in the STOP position, you press (or rather touch) the appropriate buttons and the sequence of events is as follows: First the bias oscillator is switched on, then after 100 milliseconds the head moves to position and the pinch roller starts to rotate. When the tape movement is stable (520 mS), the record amplifier is turned on and is ready after 70 mS. Finally, after 790 mS the playback amplifier is turned on. When recording stops, first the recording amplifier is switched off, then the bias oscillator slowly "dies" and the playback amplifier is switched off—the whole sequence taking 200 mS.

As mentioned above, two noise reduction systems, Dolby B and Philips DNL, are used and it might be thought that this is really gilding the lily or at least extravagant. However, a moment's thought will show that these two systems are not incompatible but actually are complementary. As most readers know, the Dolby system functions by boosting high frequency signals during recording and then reducing them at playback (A simplified explanation, but it will suffice). Now, the DNL is rather different in that it works only during playback. Frequencies above 4 kHz are cut in proportion to level as shown in Fig. 3. Note that the maximum effect is in the region of 10 kHz and that the system has virtually no effect above levels of -40 dB. So the DNL system can be used on playback with ordinary tapes and the Dolby reserved for recording. Can you use both together? The answer is yes, and the total noise reduction is then about 13 dB. For most purposes, it is probably better to use them separately as suggested.

The main play-transport motor is a servo-controlled phonic wheel d.c. type and a double capstan is used with staggered heavy flywheels. A second motor handles fast forward and rewind. Because there are separate record and playback heads, each can be designed for optimum results. Thus, the gap in the record head is 5 microns but the playback head has an exceptionally small gap of only 0.7 microns! This enables the high-frequency response to be maintained up to 20 kHz or so, but it does mean that care must be taken to keep the heads clean and aligned properly. Figure 4 shows the record-replay response from the Nakamichi CrO_2 tape supplied, and Fig. 5 shows the response with low-noise tape, also Nakamichi. The chromium dioxide tape has a wider response (3 dB point at 21 kHz against 19 kHz) but the difference in practice is small. Incidentally, the tape selector switch is marked CrO_2 and NORMAL, but in this instance NORMAL refers to low-noise tapes like TDK SD or Maxell UD and so on. Figure 6 shows the response from a standard playback tape and distortion is shown in Fig. 7. Distortion at 0 VU was a low 1.4% increasing to 3% at +3 VU. Distortion versus frequency can be seen in Fig. 8. Signal-to-noise measured 53 dB (ref. 0 VU) increasing to 63 dB with Dolby. Some makers still use a 3% distortion reference figure which would make the figures 56 and 66 dB respectively. Erasure, with CrO_2 tape, was 66 dB. Line input sensitivity was 100 millivolts and microphone sensitivity was just under 0.5 mV—0.45 mV to be

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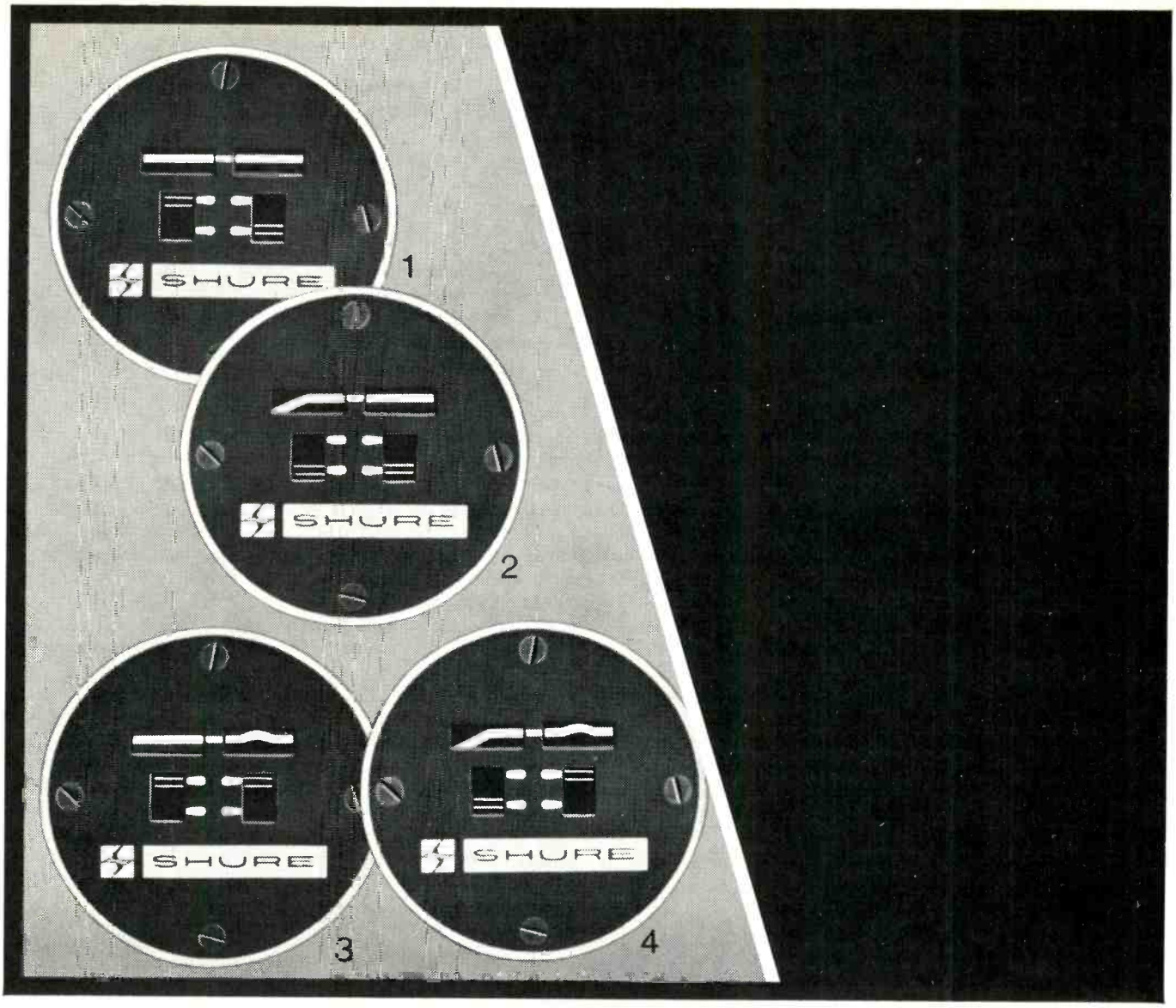

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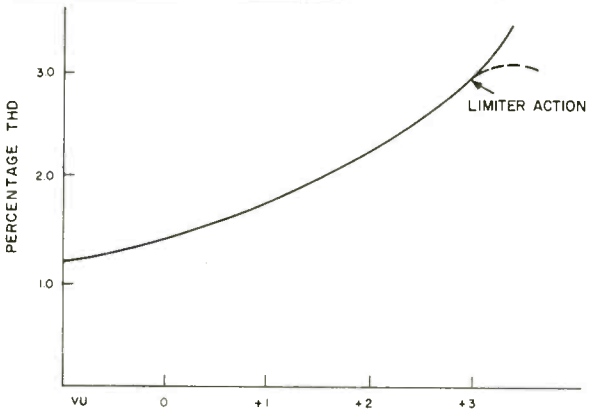

Fig. 7—Distortion at 1 kHz. Dotted line shows limiter action.

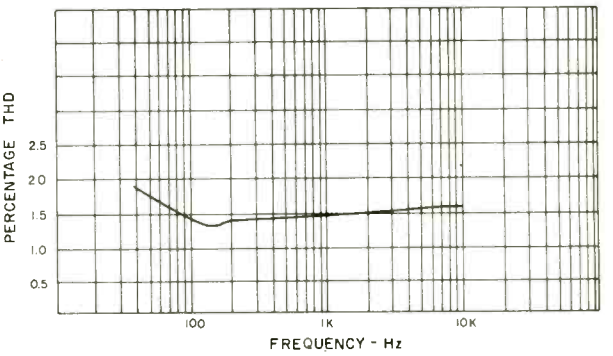

Fig. 8—Distortion versus frequency.

precise. Output for 0 VU recording level was 1 volt. Wow and flutter came out at 0.17% unweighted peak which corresponds to a weighted figure of about 0.06% (DIN 45507). This, incidentally, is the best we have ever measured for any cassette recorder. Rewind time was 57 seconds for C60 cassettes.

The first thing I did after making sure everything was OK, was to check the head alignment. It was right on the nose but the adjustment was investigated to see how well the device really worked. Once you got used to the time delay, there was no difficulty whatever and even the most ham-handed novice can get perfect alignment every time. So, full marks to Nakamichi for a most ingenious idea! After the various measurements were taken, recordings were made with and without the Dolby system, and they compared very favorably with those made with a standard open-reel machine. The DNL system was used on occasion and it certainly helped when playing back some old tapes. It was not found necessary to use the limiter, although it might well prove useful when making direct recordings. The controls themselves, especially those feather-touch buttons, were a joy to use. The eject button does *not* throw the tape half-way across the room, and it cannot operate when the tape is running. In fact, none of the tape controls will function until the STOP button is touched—that logic system is foolproof!

The 1000 comes complete with a large linen-bound folder or case in which are cleaning sticks and solvent, a Dolby alignment cassette, a special cassette with a built-in mirror so you can see the heads, a CrO_2 cassette, a head cleaning wand and a dusting cloth. The comprehensive technical manual also includes an individual specification sheet with a frequency response curve.

Summing up: The Nakamichi 1000 is definitely a state-of-the-art cassette recorder. Because of the low tape speed and reduced track width, cassette tapes are severely handicapped with respect to open-reel, but with the use of separate record and playback heads, accurate alignment, plus efficient noise reduction systems, Nakamichi has achieved results which would have been thought absolutely impossible not so long ago. Not only that, but they have come up with a professional machine that is even simpler to operate than an ordinary domestic recorder!

Memo to Nakamichi—please do not ask me to return the recorder yet! *George W. Tillett*

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Frazier Concerto Model F-10W-37

MANUFACTURER'S SPECIFICATIONS

Nominal Impedance: 8 ohms. **Drivers**: One 10-in. woofer in ported enclosure, one high frequency horn. **Crossover Frequency**: 2000 Hz. **Control**: Tweeter Balance. **Usable Frequency Range**: 35 to 17,000 Hz. **Grille**: Removable sculptured foam. **Dimensions**: 16 in. D x 16 in. W x 21½ in. H. **Price**: $200.00.

The Frazier Concerto is a two-way speaker system using a high compliance 10-in. woofer in a vented enclosure for bass and medium frequencies, and a horn tweeter for frequencies above the crossover of 2000 Hz. The top and both sides of the enclosure are attractively finished in natural wood and a removable sculptured-foam grille is available in burnt orange, brown, or black.

This system is designed to be a floor-standing reproducer, and with a height of 21½ inches and a mar-resistant floor-standing base, it is, as stated by Frazier, perfect end table height. The enclosure has a sufficiently sturdy top and a low enough center of gravity that lamps, ashtrays, and the like may be safely placed on the Concerto if this recommendation is taken, but the finish of the wood top can suffer if abused, as with any piece of fine furniture.

The unfinished back of the Concerto contains the tweeter control in a recessed cavity. Unfortunately, this rotary control is neither labelled nor supplied with a knob to identify position should it be desired to change the balance. Because

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the control is a potentiometer that can be set from zero tweeter output to a level much "hotter" than the woofer, it is hoped by this reviewer that Frazier will improve this situation in future production units. In the unit tested by AUDIO, the most accurate balance for direct sound was found to occur about midway between the extreme positions of this control.

A terminal strip is mounted on the back for electrical connection to the speaker, and the terminals are marked with small but legible polarity marks. This is a screw terminal type of mounting which will take either spade lugs or bare wire. The screw terminals are very close together and no mechanical barrier is provided between the exposed terminals. Care must therefore be taken in hookup so that an accidental short circuit does not occur due to a loose or improperly made connection. Single conductor wire, rather than stranded hookup wire, is recommended by this reviewer for the Frazier Concerto to minimize the possibility of an amplifier-damaging short circuit during hookup, and the chance of such an occurrence if the speaker is frequently moved for cleaning or decor purposes. Under no circumstance should hookup be made to the speaker while the amplifier is on and delivering program material. Again, this reviewer hopes Frazier will improve this situation on future models. (Frazier tells us that the current version of this model uses banana plugs to alleviate this problem.—Ed.)

No hookup instructions or recommendations (that would be helpful to a less technical user) were supplied with the model received by AUDIO. The Frazier Concerto carries a five-year warranty against defects in workmanship and materials.

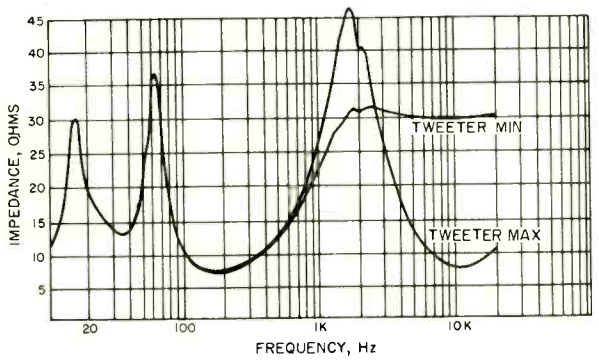

Fig. 1—Impedance for two extreme positions of tweeter control.

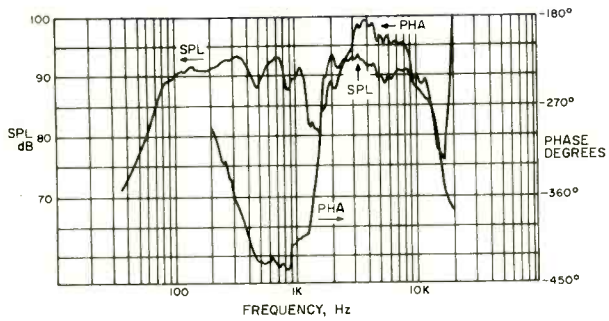

Fig. 2—Magnitude and phase of the anechonic frequency response one meter on-axis with one watt input.

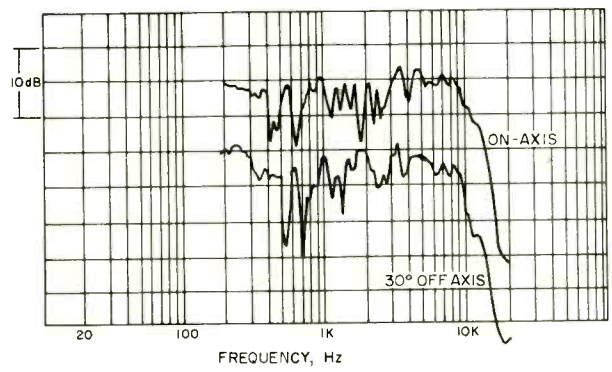

Fig. 3—Frequency response of the first 10 milliseconds of sound in a conventional listening situation three meters from the Frazier Concerto. On-axis and stereo response shifted 10 dB for clarity.

Technical Measurements

The Concerto is rated as an 8-ohm system, and this is a realistic minimum value as shown in the impedance plot of Fig. 1. The impedance plot has the two low-frequency peaks characteristic of a vented system. The lower peak occurs at 18 Hz and the upper peak at slightly above 60 Hz. Because the tweeter control is potentiometric, the plot is made for the two extreme control positions. In any other control position, the impedance will lie between these two curves.

The one-meter anechoic frequency response for a one-watt excitation is shown in Fig. 2. The Concerto ranks as a moderately efficient system and satisfactory sound level can be produced from amplifiers rated 20 to 50 watt. The pressure amplitude shows a low frequency roll-off below 90 Hz. The fact that this does not occur near the 38 Hz impedance minimum of Fig. 1, as well as the nearly 12 decibel per octave roll-off, suggests that this phase-inverter vented enclosure was not designed by Frazier engineers according to the more conventional alignments of such systems.

The pressure phase spectrum of the Concerto is technically very interesting because there is an exact 180 degree phase change which occurs between 1400 Hz and 2100 Hz. The conventional logarithmic frequency plot is difficult to interpret under these circumstances, however a linear frequency plot of the phase spectrum (not included) discloses that the woofer is precisely in phase with the drive voltage. By this we mean that a positive voltage applied to the positive speaker terminal will produce an acoustic pressure increase exactly in phase with that voltage for high frequencies. The Concerto is thus phased properly for bass should it be desired to use it with other speakers, such as for quadraphonic rear channel operation. The tweeter is 180 degrees out of phase above 3 kHz and has a mean average acoustic position approximately 2.4 inches behind that of the woofer. The SPL response dip at around 1.4 kHz is due to this polarity reversal between woofer and tweeter.

This does not mean that Frazier was careless in assembly. Quite the contrary, reversing the tweeter leads to bring it into phase with the woofer actually produces a very audible broad dip in response at around 2.5 kHz.

The three-meter room response of Fig. 3 shows the effect of the room in filling up this apparent dip. Figure 2 is the anechoic response which does not contain any wall, floor, or ceiling reflections. Figure 3 is the spectrum of the first 10 milliseconds of "early" sound when the Concerto is placed on a carpeted floor. The on-axis and 30 degrees off-axis measurements are shifted 10 dB in Fig. 3 for simplicity of presentation. The low height of the woofer above the floor causes a multiplicity of SPL interference notches below 2 kHz due to the grazing sound incidence when the speaker is listened to in a conventional manner. Ceiling reflections are less severe than floor reflections because of

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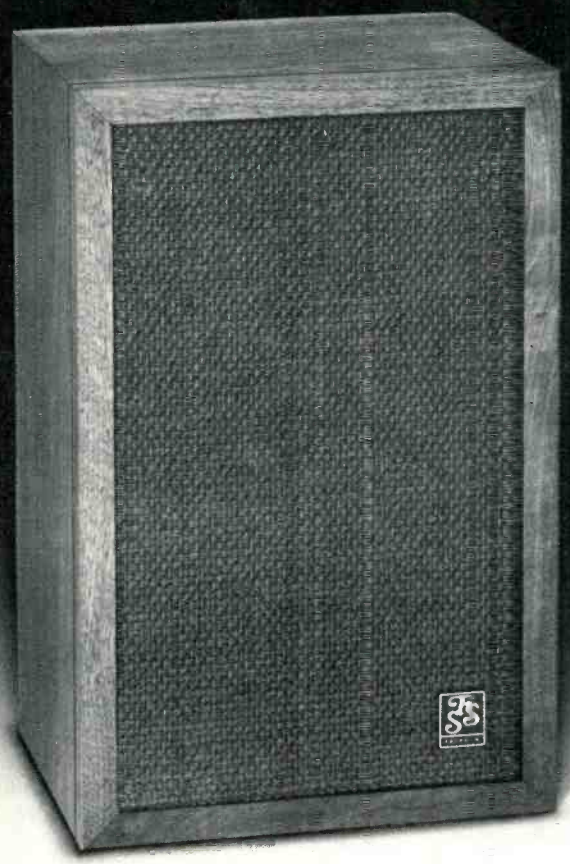

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the vertical polar response of both woofer and tweeter. The power spectrum of the early sound shown in Fig. 3 is thus much more uniform on the average than the anechoic response of Fig. 2. The Concerto should, and does, sound quite smooth in the 1 to 5 kHz range even though the anechoic response shows a dip. However, the severity of interference notches due to the shallow vertical height of the Frazier Concerto suggests that this speaker should be placed on an acoustically dead surface, such as a rug, in preference to a hard floor. The surprising feature of the three-meter test is that the phase (not shown) of the early sound uniformly changes its full 180 degrees, starting at 1.4 kHz and ending at 2.1 kHz without the slightest trace of a power spectrum dip or peak.

The harmonic distortion for the musical tones E_1, A_2, and A_4 is shown in Fig. 4. These are measurements made on the woofer since it handles the spectrum below 2 kHz.

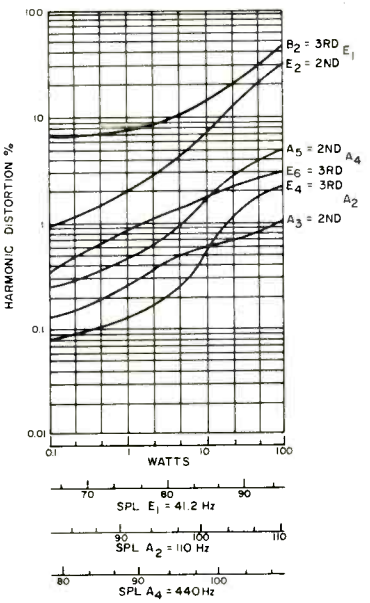

Fig 4–Harmonic distortion for musical tone of E_1, A_2, and A_4.

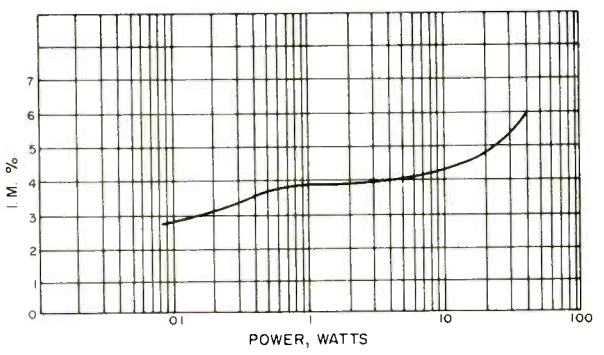

Fig. 5—Intermodulation distortion of A_4 (440 Hz) by E_1 (41 Hz) mixed 1:1.

Intermodulation distortion for the tones E_1 and A_4 mixed 1:1 is shown in Fig. 5. The rather unusual shape of this curve is due to the spectrum modification of the modulation with increase in drive. At low power levels the dominant side bands about A_4 are even order harmonics of E_1. With increase in drive power, the odd order sidebands become prominent while some even order sidebands remain constant and the others decrease. At the higher power levels, this particular two tone intermodulation is almost equally due to phase and amplitude modulation. The implication of both the harmonic and intermodulation characteristics is that low bass program material such as pipe organ will not be reproduced to the full satisfaction of highly critical listeners.

Crescendo handling capability is measured by noting the extent to which an inner musical voice is suppressed by the introduction of a higher power wide-band random-noise signal. One decibel of 440 Hz suppression occurred with a peak power of 450 watts, corresponding to an average noise power of 50 watts spread over a band of 20 Hz to 20 kHz. The Concerto is thus capable of handling musical peaks well above its stated continuous rating of 25 watts.

The one-meter polar energy response is shown in Fig. 6. This is quite an acceptable polar pattern and shows that good stereo separation of sound should be obtained without any tendency to bias the sound image either to the right or left. Slightly better high frequency response in a stereo configuration can be obtained by rotating the speakers toward the listening area.

The response to a band limited impulse is shown in Fig. 7. The equivalent signal applied for this test is a nearly perfect impulse which has been band limited in its frequency content to contain only components from 20 Hz to 20 kHz. The shape of this frequency spectrum is modified by what is called hamming weighting to more accurately portray the time response of Fig. 7. The data plot of Fig. 7 has been automatically clipped to a baseline 40 dB below the peak energy value. The double humps centered at 3.25 milliseconds are due to the woofer. The main peak at 3.43 milliseconds is due to the horn tweeter as are the subsequent peaks at 3.65 and 3.9 milliseconds. The equivalent positions of major components in the Frazier Concerto are shown in Fig. 7 for comparison.

Listening Test

The Concerto does a creditable job of realistically reproducing program material which possesses strong midrange components. While the extreme high frequencies are down in level, the dropoff is smooth and free from annoying presence peaks. It is thus possible to employ a moderate high frequency boost without incurring a "spitty" top end.

In this reviewer's opinion, the Concerto's deficiency of very low bass response is its least advantageous acoustic characteristic. Three positions of the speaker were auditioned: floor standing away from a wall, against a flat wall, and in a corner. Only the corner position provided a reasonable bass response without the excessive use of a tone control equalization. In other room positions the deficiency in bass was quite noticeable. Bass boost by means of a conventional tone control is not recommended for moderately loud reproduction of material which has good low frequency content because good, deep bass begins to sound "blasty" as the level is raised.

Subsonic frequencies, such as due to reproduction of a badly warped record, can cause audible program modulation at high sound levels in the Concerto. For this reason, this

(Continued on page 81)

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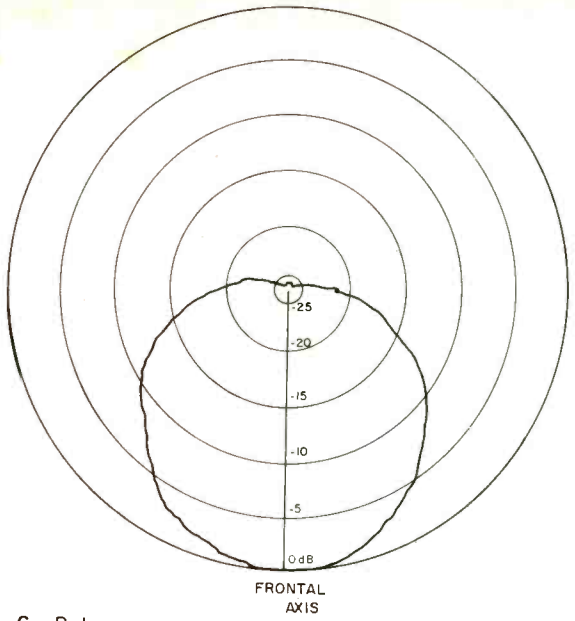

Fig. 6—Polar energy response.

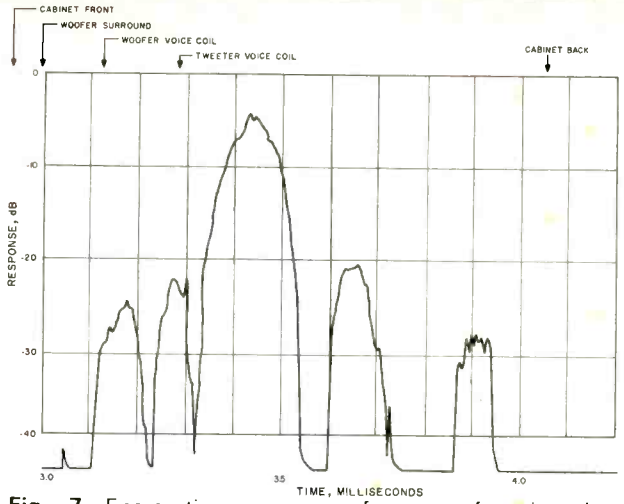

Fig. 7—Energy-time response for a perfect impulse, hamming weighted and band limited 20 to 20,000 Hz, measured one meter on axis.

Angular dispersion is quite smooth within thirty degrees of the on-axis position. Mounting the Concerto in a corner should provide a smooth stereo sound image since most listening positions will be within this angular spread. For wall or floor mounting positions it is helpful to rotate the speakers slightly toward the listening area.

Acoustic balancing of the unmarked tweeter controls can be quite a chore for stereo listening. This reviewer recommends that after placing the Concertos where you want them to be, rotate each tweeter control shaft to a position halfway between its extreme left and right position. Using an FM tuner as source, tune it off station so as to get the characteristic "rushing" sound. Then make any fine adjustments necessary to the tweeter controls to make the noise sound as close as you can to the sound of a shower spray which seems to come from a position halfway between the speakers. Because of the high frequency de-emphasis in the FM tuner, it is advisable to apply some tone control treble boost to aid the sonic illusion of a shower spray.

The Frazier Concerto can be recommended to those whose preferences run to "easy listening" music, but in this reviewer's opinion, this speaker would not fare so well with those who demand low organ, bass, cello or piano fundamentals.

Richard C. Heyser

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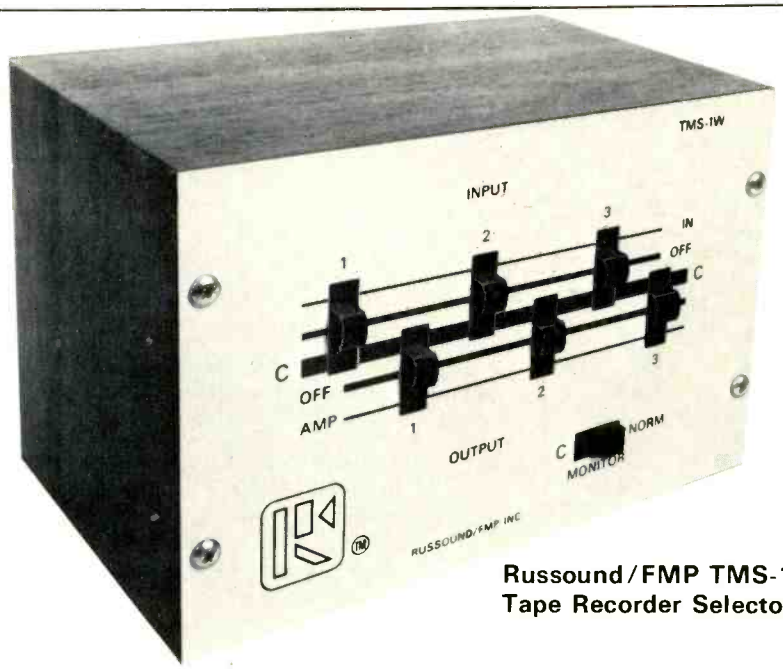
The Workbench

Herman Burstein



Russound/FMP TMS-1W
Tape Recorder Selector Switch

IF YOU HAVE BEEN wondering how to connect two or three tape decks to your audio system, and to each other for dubbing and phasing (described in the December 1973 issue of AUDIO), the TMS-1W offers an excellent solution at a reasonable price (about $33).

Basically, it is intended for up to three stereo tape decks. However, a quadraphonic system can be served by two TMS-1W units in parallel; more than three decks can be accommodated by TMS-1W units in series.

The TMS-1W is connected to an amplifier's (or receiver's) tape output and tape monitor jacks in exactly the same way as a single tape deck would be. The amplifier jack marked TAPE OUT (or TO TAPE RECORDER) gets connected to the TMS-1W jack marked TO OUTPUT. The amplifier's TAPE MONITOR jack gets connected to the TMS-1W jack marked TO INPUT.

The inputs of one to three tape decks are connected to the INPUT jacks of the TMS-1W. Thus, one to three decks can record the signal from the amplifier's TAPE OUT jack. Similarly, the outputs of one to three tape decks are connected to the OUTPUT jacks in the TMS-1W. Thus, the amplifier can receive the playback signal from any one deck or from a mixed combination of them.

In addition to permitting up to three tape decks to be connected to an audio system, a primary purpose of the TMS-1W is to permit dubbing. A playback signal from one deck can be recorded on one or two other decks. Or the playback signals from two decks can be combined and recorded on a third deck. A MONITOR switch gives the user the option of monitoring either the playback (source) signal or the dubbed signal which has just been put on tape.

For each deck the TMS-1W provides two switches, one to direct the input of the deck and the other to direct the output of the deck. Each input switch has three positions: OFF; IN, so that the deck can record a signal from the amplifier; and C (common), so that the deck can record a signal directly from decks whose outputs are connected to the TMS-1W.

Each output switch also has three positions: OFF; AMP, so that the deck can provide a playback signal to the amplifier; and C, so that the deck can provide a playback signal directly to the decks whose inputs are connected to the TMS-1W.

The previously mentioned monitor switch has two positions: NORM supplies the amplifier with the playback signal from one or more decks if their output switches are in AMP position; C furnishes the amplifier with the playback signal from one or more decks if their output switches are in C position (as could be the case when dubbing).

The TMS-1W can be used to "interface" not only tape decks but other audio components as well. For example, one could use it to connect the outputs of several tuners, or of several preamps, to a power amplifier; to feed a TV audio output to one's audio system; to hook up a reverberation unit, noise reduction unit, graphic equalizer, or other component between the amplifier's TAPE OUT and MONITOR jacks without eliminating the ability of the audio system to accommodate a tape deck.

All told, the TMS-1W is a versatile signal splitter, mixer, selector, and patch panel for high level inputs and outputs of audio components. Being a passive device (no transistors or tubes), it does not introduce distortion, noise, or frequency change. Its switches are quiet and positive acting, and, at least in the system in which it was tested, does not introduce clicks. In its walnut case it measures 3¾ x 5⅝ x 3⅞ inches (in its utility steel case, 3 x 4¼ x 3½ inches), and should ordinarily raise no problem of finding room to accommodate it in a cabinet or bookshelf. In any event, in its walnut case, it is attractive enough to be mounted externally.

I have but one, quite minor reservation about the TMS-1W. This concerns identification of the position of each switch. These are slide switches, and the slider is black against a black background. However, a dab of red fingernail polish on each slider quickly and effectively disposes of this problem. A toggle switch in a future version might be a further visual aid. Once the user has identified the position of the slider switch, the front panel of the TMS-1W is well marked to make clear what is connected to what.

In conclusion, Russound deserves compliments for coming up with a well-conceived, well-executed, and useful auxiliary item for home audio systems, particularly where tape decks play an important role.

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Dylan at the Spectrum

Sherwood L. Weingarten

THE WIND PLAYED hide-and-seek with the denim army methodically approaching the circular walls of Philadelphia's Spectrum. It whipped through the nearby parking lots that jammed in as many cars from New Jersey and Delaware and other states as from Pennsylvania. Those who hawked souvenir programs, posters or soft pretzels waved their arms wildly, as much to keep warm as to sell their overpriced wares.

A handful of optimists meandered through the crowd that overcast Sunday afternoon in January in futile search of their own version of a rainbow: "Anybody got an extra ticket?" They were ignored mostly, now and then silently laughed at for their foolishness. It was a sellout, and had been for some time, almost from the moment the concert was announced.

Dylan. The name meant magic. It conjured up slightly sullied visions of the '60s: protest, hope, originality, revolution. But this was the dream come true, the symbol live, in person, here, now.

It was the second stop of the national tour, his first in almost eight years. The beginning was only a few days past, in Chicago, and now it was Philly's turn. And Philadelphia didn't even seem to mind it was second-rate one more time.

Inside the auditorium that soon would seat nearly 20,000 remnants of a wistful, chameleon decade, a paper airplane glided from the top tier, setting off a flurry of similar launchings. It was almost 2 o'clock, almost time for what many still hoped would be a Second Crusade. "When did he get into town?" asked one

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friendly stranger to another. "I dunno. Heard he came in last night."

"Bet this is a ripoff," said another. "He'll probably do all his old stuff, in about a 15-minute gig, and then split."

"Bet he does some new things," retorted still another. "And he'll keep that aura of mystery. Wouldn't be surprised if he appears out of nowhere in a puff of smoke."

On the ground level, with the seats packed in so tightly you could tell if your neighbor had bad breath, a couple of inflated balloons were being bounced along by an otherwise placid audience-in-waiting. Upstairs, a giant's handful of spectators sat at the balcony edge, arms entwined in railings, feet dangling in nothingness and mouths chanting: "We're ready, we're ready, we're ready."

At 2:20 the clapping and whistling of impatience started; even worshippers wear watches these days. At 2:32, with the sweet smell of marijuana virtually filling the place, the catcalls began, and the rhythmic foot-stomping. Abruptly all that ended, replaced instead, as the house lights went off, with one massive roar. Bob Dylan and members of The Band stepped up to the oriental rug-covered stage. Squeak, twang, urp. They tuned, and the audience hushed to hear it all.

Eight minutes later, after the Living Legend had unfurled his long scarf, seemingly the same one that adorned the cover of **Blonde on Blonde,** he was singing one of his most obscure pieces, *The Ballad of Hollis Brown.* Few apparently recognized it, but fewer cared: The Vietnam generation had its spokesman back, and so what if we've all aged, slid into the apathetic '70s?

Lay, Lady, Lay followed, an echo from a later time, a remembrance of the Nashville scene, and the audience relaxed. Tranquility personified.

Just Like Tom Thumb's Blues was a momentary exorcist: some of the former counter-culture freaks could actually be seen keeping time with a tapping toe or two. The beat was different this time around, but no one was booing, as they had earlier in his career, because he played an electric guitar.

And when he was joined on the chorus of *It Ain't Me, Babe* by two members of The Band, the excitement grew. His switch to harmonica drew cheers; his sometimes muffled voice, drowned out by his backup men, now superstars in their own right, fazed no one. His bushy hair and scraggly beard were familiar, oh so pleasantly familiar. So was the voice that was never a voice meant for music in the classic sense.

Next came a turn at the piano, and then, 27 minutes after it had begun, he moved to the rear of the stage to let The Band have some undivided attention.

The crowd listened and listened well, for the acoustics were better than for most rock concerts in the hall. But the uneasiness was evident, and every so often some guy would yell, "Come on, Dylan, we paid to see *you*." Still, the countrified sound blasted without him. *The Night They Drove Old Dixie Down, I Shall Be Released.* A couple more, drawn mostly from their classic first two LPs.

Half an hour later, the return. Bob Dylan. With sunglasses, still wearing the black suit with which he started the concert. *Knockin' on Heaven's Door,* from the recent **Pat Garrett and Billy the Kid** soundtrack album that bombed, got the audience up again, just in time for a short intermission. "Don't go 'way," said Dylan in one of his longest speeches of the day.

Part two was what they, many who hadn't even learned their ABCs when Dylan was hitting it big as a pop poet, were waiting for. The jacket gone. Work shirt and vest obvious, the image aided by muted lighting. Armed with acoustic quitar and harmonica. Solo.

Love was the name of the game. They gave it to him, as best they could remember how, and he gave it back, sort of. Through oldies, and through new songs, love songs, tunes with absolutely banal lyrics that showed the times, they had indeed a'changed. He never told the titles, merely referred briefly to the latter as "new songs," but the buffs assumed they were from his new Elektra-Asylum album, **Ceremonies of the Horsemen,** as of then unreleased. Something was wrong, though. *Except You,* a first half entry, and *Forever Yours,* part of the solo set, sounded as if they were penned by Harry Highschool, not *the* Bob Dylan.

But the uneasy feeling they created didn't last. *It's All Right Ma, I'm Only Bleeding* had rolled in like the ghost of revolutions past. The crowd collectively recalled who it used to be, and momentarily interrupted Dylan's singing with hoots and right-on, baby, and yeah, yeah when he intoned: "Even the President of the United States/Must sometimes stand naked."

And when the solo section had ended, and The Band had taken over again for a while, there were periodic cries of "Dylan, Dylan" from the faithful, most of whom couldn't see him fussing with his hair at the back of the stage. When he returned stagefront, they had again shouted, reveled in the idea that an old friend had come back. But it was a strange shouting, not like the routine, fanatic rock audience, more like a chorus that knew it was *supposed* to be excited and therefore *was,* not unlike an expensive New Year's Eve party a couple of weeks late.

Like a Rolling Stone was an appropriately rousing final number. Even a few people stood and kept clapping time. And when it was over, an ending that resembled a quasi-religious orgasm, Dylan said simply: "This is it . . . so we'll see you next time."

It took a few moments to sink in. Over. Done. The Happening was finished. And like a sleeping giant, the audience went wild, really wild for the first time all afternoon, breaking the restraints of somebody's idea that the whole thing was sacred and not, as Dylan's men had been touting for weeks, that it was a concert, just a concert, and not a cosmic event.

So the firecrackers went off, as they had during intermission. And thousands of matches were lit, making the hall resemble an indoor skyscape, and the feet-rumbling grew more intense, and the cheers ran into one another. Six minutes worth. When the house lights went on, the boos came, but few left until a stage manager took the mic and said, "On behalf of Bob Dylan and The Band, we thank you for coming."

It was *really* over now.

Outside, the chill having grown more vicious, the army of youth filed neatly away from the Spectrum, back to its cars, back to the creature comforts of the Mainline and suburbia. They'd heard *Leopard Skin Pillbox Hat.* And *The Lonesome Death of Hattie Carroll.* And more, so much more.

They'd lived through the '67 cycle crash and its aftermath, the rumors of Dylan being crippled, dead. And through the country scene with Johnny Cash. And through him trying to sing sweetly. Through it all.

"Wasn't that just great?" asked one young man rhetorically of the 2½-hour concert.

"Yeah, he was groovy," said another, lapsing into the vernacular of history.

"I don't know, man," said a third, pulling his collar higher. "If you ask me, old rock singers never die *or* fade away, they just go on a 25-city tour. AE

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Classical Reviews

Edward Tatnall Canby

SMALL-COMPANY RENAISSANCE

Bartók: Sonata for Two Pianos and Percussion (1937); Seven Pieces for Two Pianos (Microcosmos). Katia and Larielle Labeque, pfs., Sylvio Gualda, Jean-Pierre Drouet, Percussion I and II. **Mus. Heritage MHS 1499,** stereo, (Mail: 1991 B'way, NYC 10023).

Offenbach Overtures. City of Birmingham Symp. Orch., Frémaux. Klavier **Patrician KS 517,** stereo, $5.98.

Alec Wilder: Sonata for Clarinet and Piano, Suite for Flute, Clar. and Pf. Frank Levy: Sonata for Clar. and Pf., Adagio and Rondo for 2 Clars, Bass Clar. Mitchell Weiss, cls., Janet Weiss, fl., Zita Carno, pf. **SoundMaster SMP 1003,** stereo (37 W. 57th St., NYC 10019).

Brother Martin Senior High Chorus, 1972 Stage Band. Custom pressed. (Recorded Publications, Inc., Camden, NJ 08105).

Take heart, you record buyers! Look out, big companies. The small labels are in front again. It hasn't been this way since the great LP rush of the early 1950s, when hundreds of small outfits explored the brand new combination of portable tape recordings and the LP disc.

The top-size U.S. record companies have worked themselves into an astonishing disarray at this point. Just look at their "new release" classical lists. Quite soberly, these concerns are for the moment largely repackagers of their own earlier product. Fine idea, but not very progressive. The little outfits, taking flexible advantage of superb technical facilities, once again are exploring the world of music outside the narrow big-name, big-cost system, for new artists and for new sonic material to match present technical know-how. And they can beat the big companies hands down! They have the dedication and the time and they do it relatively inexpensively.

The Bartók *Sonata*, for two furious, unbelievable pianos and an incredible two-man battery of percussion, is often heard in its bigger *Concerto* format. On records, the *Sonata* version is much the most dramatic, especially when recorded, as here, at sawed-off-shotgun range! This is a great recording, considering the horrendous technical problems—the unbelievable dynamic range, the rifle-shot transients in piano, drums, xylophone (wait until you hear *that*!), the whole incredibly complex and super-rhythmic score. These two furious ladies play mostly percussive piano, which is OK though there are lyric moments as well; the two percussionists are marvelous and the neat right-left division, one battery of percussion and one piano on each side (as per Bartók's own direction, if I remember) makes really top listening. Memorable moments: the xylophone explosion, beg. of side 2; the infinitesimal snare drum taps that end the work. What a piece! What a record!

Can't afford a big-name orchestra? Try the City of Birmingham. The fizzy, zesty Offenbach *Overtures* are played here with a precision and verve that few big orchestras could match, and the recorded sound is excellent too.

Alec Wilder has composed quantities of music; these two pieces are very much of his generation (b. 1907), modern but a bit quirky, testy, the touches of jazz and folk and classical technique not too well blended. Enjoyable nevertheless for expert writing and plenty of energy and color. Frank Levy, of a younger generation, writes smoother, more polished music, nicely humorous, a sort of much-lightened-up Hindemith with U.S. overtones. I enjoyed his music for three clarinets, one in each loudspeaker and the bass clarinet in the middle. All three, triple tracked, are the same player.

As for Brother Martin High School, somewhere in Louisiana, I gather (they don't say), the Chorus is kids just out of the soprano/alto stage, bursting with 'teen energy, and the recording of their concert has such extraordinary presence that it makes my favorite demo disc—especially as heard quadraphonically via a decoder. (It isn't coded.) Every voice is clear, you get each word, each breath, you can almost touch the faces before you, yet the ensemble is perfect, the surround ambience excellent, the blend and balance ideal. Maybe it was just luck, but no matter! An extraordinary job. The singing varies from endearing to disastrous (they go flat each verse); some of it is first rate. *The Stage Band*, on the other side, is good too, a big-band-type ensemble with the kids trying hard to sound grown up and a bit bored by it all. Understandable, and there is virtuoso playing, good in the technique and in the musical understanding. A lot better *this* music than the dreary "classical" band music so many kids play in school. My opinion, anyhow. Try it and see.

César Franck: Pièce Héroique; Prière; Final, Pastorale (Six Pièces). Michael Murray, organ of St. Meinrad Archabbey, Indiana, **Advent 5007,** SQ, (23366 Commerce Park Rd., Cleveland, OH 44122).

Triple-threat combination of this disc. A splendid big modern-Romantic organ in a grand stone Archabbey, an unusually musical and sensitive young organist, in the direct line of succession from Franck himself, and a fine, big recording, coded for SQ quadraphonic.

There are plenty of practitioners of French organ music. A good many of them, however famed in organ circles, leave the non-specialist ear out in the cold—especially in César Franck's long, personal meandering semi-mysticisms. This non-Frenchman will catch your listening ear if anybody ever can. He feels and understands. He plays with continuity and drama. He listens to his space, and paces his music to fit (so few organists do!). As a student of Marcel Dupré, who was a student of Guilmant, who worked directly with César Franck, Murray has the performing style and registration from the horse's mouth, and he knows what to do with it.

Superb rumbly bass is a nice added feature. Rattled my teacups and occasionally blasted my system—my fault, I suspect, not the groove's fault. This is a marvelous example of the grand old-fashioned roarer organ at its most persuasive.

César Franck: Sonata for Violin and Piano. Szymanowski: Mythes. Wanda Wilkomirska, vl., Antonio Barbosa, pf. **Connoisseur Society CSQ 2050,** SQ quadraphonic, $5.98.

The Franck *Sonata* is a lovely old-fashioned work that was once played wherever chamber music was heard, has more lately been in eclipse, betwixt and between—not yet "classical" and no longer new. It is coming

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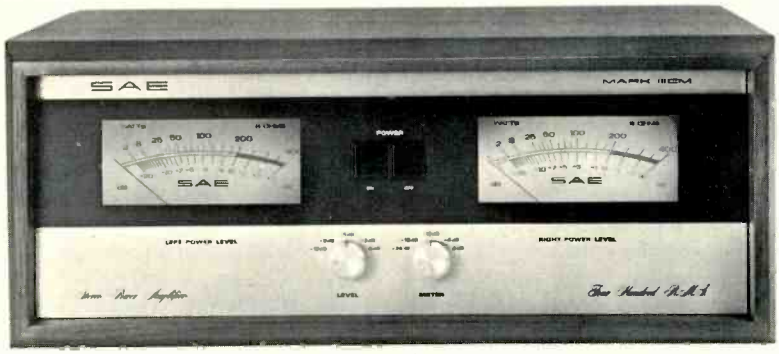

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back, and this is an understanding performance by two young people who know all about the somewhat perfumed Franck style with its never-ending sequential changes of key, phrase by phrase. They are equal partners, as the music demands, and the recording gives them equal sonic billing. The much more lush, thick, mystic-late-impressionist Szymanowski, Polish-French of around 1915, is even more firmly taken in hand, an excellent performance of its complex double stops for the violin and the watery cascades of sound that must flow from the piano.

An odd SQ effect—but I suspect it is a quirk of the hall: The piano stays solidly put, but the violin has a sort of fluttering ghost-double, a second fiddle somewhere in the back of the hall. Could be a reflecting wall, off some distance. Very live sound, in any case. I seem to remember similar sounds in earlier Connoisseur recordings, probably made in the same place. Nothing to bother you in the least, just interesting to hear in your living room.

* * *

FILM SCORES

Captain from Castile,
The Classic Film Scores of Alfred Newman RCA Red Seal, ARL1-0184, $5.98.

Warners and MGM are doing it, too: releasing the scores composed by their music directors for the most popular films over the decades. Erich Wolfgang Korngold, Max Steiner, Franz Waxman, Bernard Herrmann, Alex North—names known only to a few cineastes, although they flashed briefly on the screen as part of the credits. But what sounds they composed to accompany scenes in the Golden Age of Hollywood often became as well-known as the classics. Consider Max Steiner's *Tara's Theme* from *Gone With The Wind*, or, more recently, Maurice Jarré's *Lara's Theme* from *Doctor Zhivago*. People still whistle and hum them—and, perhaps, make love by them (life, as it will, tending to mimic art).

Alfred Newman, music director for 20th Century Fox and nine time Oscar winner, wrote scores which have been newly recorded by Charles Gerhardt and an orchestra called the National Philharmonic, which sounds impressive and is completely unknown to me. The fact that the album does not lift the

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scores directly from the soundtracks is not always to the good—those who own the original recordings, where available, will discern some unfortunate lacunae.

The score for *Captain from Castile* is typical Newman (the film was released in 1947). It has the kind of convincing romanticism needed to support Tyrone Power and Jean Peters in Montezuma's empire. And the conclusion, called *Conquest* (the allusion is, presumably, military rather than amatory), features a full drum and bugle corps augmenting the orchestra: 128 instruments in all. The effect in stereo is impressive.

The familiar theme from *Wuthering Heights* is plaintive, almost achingly tender, and I defy anyone to recall a scene more typical of the era than Merle Oberon swooning in Laurence Olivier's arms.

But whereas the romantic ambience suited him well, Newman was uncomfortable with religious themes: his score for *The Song of Bernadette* sounds today like a mawkish musical cliché: tremolo strings, oddly erotic woodwinds—and the inevitable oooo-ing angelic chorus (here, the Ambrosian Singers). How different from, say, Franz Waxman's undeservedly ignored score for Warners' *The Nun's Story* (1959), which evoked a sense of profound spiritual struggle and purpose through understatement and understanding. (Free of saccharine and full of straightforward musical ideas, it remains for me a consistently moving score, and one that supports the idea of religious quest—something that Newman's music never addressed in spite of all its harmonic niceties.)

Page Cook's notes accompanying the record gild the lily: he terms the score for *The Bravados* one of "unusual angularity and dramatic determination." Harrummphh. It's eminently forgettable.

Anastasia does have a certain naive charm to it, but the intrusion of bells and harp glissandi suggest a lack of inventiveness. Too, there is no juxtaposition of grandeur and lowliness in the score—and that is the key to the story's ambivalence. Newman's score for *The Best of Everything* was gently sweet, which just about defines the limits of his work.

Airport's score has a basic latin rhythm that (the album notes again) "effectively portrays the excitement of a modern airport." I have the feeling, however, that it's simply a mambo Newman never had a chance to use elsewhere, and inserted it here as a coda (it was his last film score before his death in 1970).

I have the original soundtrack recording of *The Robe* (1953, originally released on the Decca label), with Newman himself conducting. While the sound quality in this newer disc is decidedly superior, the music is truncated and the score's real power, and its curiously sad theme, are rather diminished. Also, Caligula's *March* (with its tempo now almost doubled from the original!) seems amusing, not grandly decadent. Yet after twenty years I still find its finale really poignant. Maybe because it takes me back to my less complicated youth. But maybe, too, because this was one of Alfred Newman's enduring successes, as he set to music thoughts too deep for tears.

Donald M. Spoto

Performance: B Sound: A+

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Canby's Capsules

Edward Tatnall Canby

Mozart
Mozart: Flute Concerto K. 313, Oboe Concerto K. 314. Mozart: Flute/Harp Concerto; Sinfonia Concertante K. 297b. Claude Monteux, fl., Neil Black, oboe, Osian Ellis, harp, et al., Academy St. Martin-in-the-Fields, Marriner. **Philips 6500 379,380,** stereo, $6.98 each.

When Mozart wasn't too involved—flute, oboe, harp works—he invariably composed bland, marvelously perfect and relaxed music, as in three of these 4 works on 2 discs. They are really beautifully played, with superb soloists. The Concertante, with four solo winds, is another story. A large-scale, more profound piece (lost in Paris, found later in a questionable copy—if Mozart didn't write it, the other guy was just as good), and a too-light, too-fast performance here, too much like the other three; the music can "take" a lot more and often does.

Mozart: The Complete Piano Concerti: Nos. 11 K. 413, 20 K. 466, Lili Kraus; Vienna Festival Orch., Stephen Simon. **Columbia P 11814,** stereo, $5.95.

One of a dozen discs, remastered from 1965-66, available to choice. Europe's top Mozart pianist and a good little Viennese orchestra, plus—an American overlay—Stephen Simon. Intimate, serious, well-styled, somewhat rapid performances, with the right small-scale recorded sound and piano tone. Very clearly a good reissue from Columbia Special Services.

Rudolf Serkin/Mozart Piano Concerti Nos. 11 K. 413, 12 K. 414. Marlboro Festival Orch., Schneider. **Columbia M 31728,** stereo, $5.98.

One of these is a reissue—who knows when music is recorded, these days? (And does it matter?) Typically bright, youthful playing out of Marlboro's young American players and Schneider's pushing drive—plus the familiar Serkin bounce; it's not really up to best European recording but has its U.S.-style points, even so.

Colin Davis Conducts Mozart (Symphonies 39 and 40). London Symphony. **Philips 6500 559,** stereo, $6.98.

Bravo! Davis turns from Berlioz to Mozart—the best new recordings of these symphonies for years, full-bodied, stylishly light in texture, fast-paced and accurate, yet reverent and solid in sound, with velvet strings, tailored brass, wind. A lovely sound and a fine way to learn these works if you don't know them yet.

Mozart: Divertimento No. 17, K. 334; March in D. N.Y. Philomusica Ensemble. **Vox Candide CE 31074,** stereo, $3.98

Vox's intermediate label—and history repeats: one of Vox's earliest albums, c. 1946 (10-in. shellac 78s), excerpted this same work ("Saltzburg Serenade"). I loved it then, I love it now. The Philomusica does the hi-level "entertainment" music in the preferable solo-instrument form—it can also be done with small orchestra. Nicely paced, with Felix Galimir's fiddle in the lead. The little March makes entrance and exit music.

Little Marches by Great Masters. Netherlands Wind Ensemble. **Philips 6599 172,** stereo, $6.98.

This absolutely crack wind ensemble, finest in our century, makes lilting rhythms out of these little 18th c. marches—the Beethoven ones are terrific. Side 1 is best; the stuff begins to wear thin by side 2 (unless you are marching). Superb recording, Philips' usual.

Bach: Sonata No 1, Partita No. 2, for unaccompanied violin. Wanda Wilkomirska. **Connoisseur CS 2040,** stereo, $5.98.

One violin, all alone! The more Dolby, DBX etcetc. you use, the more you hear those faint busses and cars, maybe 70 dB down. That's the fact of life. The price is worth it here—the lady plays splendid Bach, beautifully in tune, uneccentric, easy to follow. A fine exposition of a very difficult art.

New York Brass Quintet Plays Knight. Now Records (stereo 4), $5.98.

". . . fascinating listening for brass specialists" sums up the *Times*. Correct! A super-pro brass prof (Ball State Univ.) writes like a computer for hugely pro NYC brass quintet, and it's a field day. Such a range of brass noises you'd never guess. Dry, academic, complex, going on and on, but not unhumorous, notably the mod jazz implications and vast stretches of chicken-like cluckings and scratchings. Weird! Very fine recording in "stereo 4" decodes dramatically via SQ.

Baroque Harpsichord. (Bach, Gibbons, Couperin, Scaritti). Wm Neil Roberts. **Klavier KS 524,** stereo, $5.98.

A forceful but somewhat heavy-handed player, a curiously twangy instrument (with notes out of kelter), recorded too close with an over-boomy bass. I liked the Bach Partita No. 1, and the Gibbons (hardly Baroque); the Scarlatti is weighty but strong-minded. Didn't like the Couperin much. No lift.

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Canby's Capsules

Edward Tatnall Canby

Vignettes of Old Russia. Sergi Tarnowsky, piano. **Genesis GS 1004,** stereo, $5.98.

Right out of the turn-of-the-century Russia, this old-time Russian pianist (California since 1930) plays salon pieces by the Russian greats, many of whom he knew—Arensky, Liadoff, Scriabine, Cui, Rachmaninoff, Medtner, Glazounov, Borodin, Tchaikovsky. The fingers are a bit stiff but the style is fabulous—the authentic late-Romantic manner, first hand. Uneven recording, often near overload, and a woody piano (Baldwin) will put you off only momentarily. The message comes through.

Mahler: Symphony No. 7. Concertgebouw Orch., Haitink. **Philips 6700. 036** (2 discs), stereo, $11.96.

Less known than the other enormous symphonies, and without voices, this still is a gold mine of good Mahlerisms, at the beginning of late-period harmonic concentration and dissonance. A solid Dutch performance here, quite beautifully shaped for the long (*very* long) pull, and nicely recorded. I like the inner mvts best (as usual); outer parts are too big and loud for my taste! Suit yourself.

Borodin: Prince Igor. Soloists, Bolshoi Cho. and Orch., Ermler. Melodiya—**Angel SRDL 4116** (4 discs), stereo, $23.92.

We all know familiar "Prince Igor" excerpts (Polovtsian Dances, etc.)—here's the whole huge opera, in Russian, a massive, handsome production sounding like "Boris Godounov." But "Igor" is basically mild and mellow, for all the vast pageantry and the huge Russian voices.

Music of Paul W. Whear. (Decade Overture; Catharsis Suite; Psalms of Celebration; Joyful-*Jubilate*). London Concert Orch. and Choir, Whear. **Advent USR 5001,** stereo, *(23366 Commerce Park Rd., Cleveland, O. 44122).*

Whear is a top U.S. local professional conductor and composer—out of Indiana, presently operating in W. Virginia—recipient of endless honors, commissions, voluminous producer of fat works for local performing groups all over. His music is big, thick, highly professional, wholly unoriginal, reminding of everybody you can remember from Brahms to c. 1940. Just fine for the local performers to work on but who on the outside wants to listen? You can if you want—see address. (Note incongruous British performance—economic necessity.)

Schumann: Quintet for piano & strings Op. 44; Quartet for piano & strings, Op. 47. Cohen, Martin, Mester, Kouguell; David Hancock, **pf. Monitor MCS 2132,** stereo, $4.98.

Doesn't say so—but I'll bet D. Hancock was the recording engineer—or at least supervisor. He is the pianist, and a well known audio man as well. This is good Schumann of modern sort, not as all-out breathless as the older tradition demands, a bit too Bach-like in tempi, but always musical. Nicely recorded, too.

Music for Trumpet and Organ. Maurice André, Marie-Claire Alain. **Mus. Heritage Soc. MHS 1176,** stereo, *mail order: (1991 B'way, New York 10023)*

A single modern trumpet here, and an organ not very distinguished in the recorded sound (Detlef Kleuker), doing a brace of transcriptions, none of them apparently for trumpet, old *or* new. As such, they're not bad. The organ sounds confined, the trumpet is far off, in a big space—curious effect.

Oscillations. Synthesized Themes and Bridges by Don Voegeli. NCAE, Madison, Wis.

These aimable bits of synthetic radio music mostly use oldies and humorous tune oddities *(King Tomb's Tut)* for an old-fashioned sound in a new format. Expert synthesizing, with a few weeps and bloops thrown in for color here and there, along with the fluent straight harmony. For Public Broadcasting.

Sound Beds 1. Recorded in binaural. NCAE, Madison, Wis.

These "sound effects" are NCAE's first binaural release. They are scenes of the expected variety—waves, cocktail party, traffic, walking, car body shop, bowling, football, etc., in longish (but not long enough) segments, from 2 to 4 minutes, starting and ending abruptly—you do your own fading. They *are* usable as stereo (loudspeakers), with some separation, but the intent and real impact is binaural via headphones. In that form they are startling. For Public Broadcasting.

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Sherwood's Forest

Sherwood L. Weingarten

Dear Boss:

I'm fatigued, dead, exhausted, bushed, dragging, beat, weary, droopy, pooped, worn. Besides that, I'm tired. And lazy. And I have a writer's block.

The weather's bothering my scars, the miserable heating system at home's bothering my sinuses, my back aches from sitting at an antiquated typewriter that refuses to do my work for me. The March deadline keeps tugging at me and though I might look like the proverbial lion with my shaggy mane and whiskers, I appeal to you like the lamb that I really am: Help!!!

I need an idea, direction, but, mostly, the ability to decide on a theme.

Should the column deal with lyrics, that oft-neglected factor of rock discs? If so, I can easily write about ***Larry Norman's*** second album, **So Long Ago the Garden** (MGM, SE 4942), which is extraordinary because there isn't a bad track among the nine Norman-penned tunes on it. The underrated, virtually unknown composer-singer's first package, **Only Visiting This Planet** (Verve, V6-5092) contained 10 cuts that were outstanding; this LP's even better, more mature.

The first time around he dealt with love and humanism, with the music shifting from blues to country to rock to change-of-pace stuff. His voice ranged from squeaky to strong, but his lyrics never lacked potency. And the listener could revel in the excellence of *Why Don't You Look Into Jesus*, a heavy blues; *The Outlaw*, a folk ballad, and *Reader's Digest*, a lament for both pop music and the shape of the world.

The second session also emphasizes creative variety. *Meet Me at the Airport (Fly, Fly, Fly)*, for instance, provides Jamaican rhythms that form a together piece that's hummable, singable and likable; it can't miss being a hit if it's promoted at all. In contrast, there's *It's the Same Old Story*, a slick but pleasant country-rock number, and *Be Careful What You Sign*, a bluesy thing that lingers in the memory. *She's a Dream*, aided by a roomful of strings, is lovely, a poignant entry more baroque in tone than the good, but badly-titled, *Baroquen Spirits*.

Nightmare, however, is the *tour de force*, a composition that does more effectively to Hollywood what Don McLean did to pop music via *American Pie*. Norman, in addition, is obviously more concerned with social consciousness. Witness:

"With the continents adrift and the sun about to shift
Will the ice caps drown us all or will we burn?
We've polluted what we own; will we reap what we have sown
Are we headed for the end or can we turn?
We've paved the forest, killed the streams
Burned the bridges to our dreams
The earth is bursting at the seams
And in pain of childbirth screams . . .
Let the proud but dying nation kiss the last generation
It's the year of the pill, age of the gland
We have landed on the moon but we'll clutter that up soon.
Our sense of freedom's gotten out of hand
We kill our children, swap our wives
We learned to greet a man with knives
We swallow pills in four and fives
Our cities look he just survives. . . ."

Great poetry it isn't, but, then, even Bob Dylan couldn't have hacked it in the company of T.S. Eliot. Still, Norman is a comer, a guy with something to say and the talent with which to showcase it.

Perhaps instead, boss, I should do something about the heavy drug-orientation in the pop-rock scene. I could, for example, couple the anti-drug LP by ***The Dramatics*, A Dramatic Experience** (Volt, VOS-6019) with the apparently pro-drug package by ***Chris Sedgwick*, The Singer Sang The Song** (RCA, LPL1-5001).

The former, a recording distributed by Stax, is mostly funky soul dealing with love themes. Two of the tunes, though, hit hard at the drug counterculture: *The Devil Is Dope* intones exactly what the title indicates, and *Beware of the Man (With the Candy in His Hand)* is a warning about the pusher with a smile who is a friend only as long as the user supplies the money.

Sedgwick, on the other hand, is a Briton who offers mostly up-tempo folk-rock via a pleasant but ordinary voice and a comparatively narrow range. Among the 11 cuts is *Mexico Gold*, with the following tidbit: "Lawdy, Lawdy, watch the blue smoke/Fly every morning and every night/To get you out of your head/ . . . who needs a natural high/When you livin' down South/ And it's growin' right outta your bed."

I could take a stand, of course, but I'm neither a crusader nor an advocate, neither a narc nor a freak; guess I'll stay out of it, except to mention that I *am* opposed to limiting discussion of drugs by *excluding* booze. Alcohol is as poisonous as the other stuff, and it too has a place in today's music.

Consider, if you will, **Lee Clayton** (MCA, MCA 365), a singer-composer with a husky voice and lots of style, some of which seems borrowed from one of his "pickin' buddies," Kris Kristofferson. Among the nine cuts, which include the Waylon Jennings' hit *Ladies Love Outlaws*, are a pair dealing with firewater. *Bottles of Booze* makes note that "heroes and losers seem to all end up in bars," while *Lonesome Whiskey* wails, "I swear I'm not the kind of man that drinks up 'til he's blind/That likes to soak his mind away one sip at a time/But I'll bet that if I died today I'd never get the news/ And the best thing for those nobody blues/Is lonesome whiskey."

Perhaps, boss, I should write about comebacks, the obvious choice being **Ol' Blue Eyes Is Back** (Warner Bros., FS 2155), ***Frank Sinatra's*** re-entry into the pop marketplace.

It's too easy, though, taking potshots at his loss of range (attempts to hit high notes are almost embarrassing) or occasional voice-cracks; rather, it should be stressed that the phrasing that made him The King is still intact, that his sensitivity to lyrics, the scars of life are still present. It's all schmaltzy, of course, with a lot of soft, stringed stuff conducted by Gordon Jenkins and arranged by both Jenkins and Don Costa. But there's no attempt, thank goodness, to cover up the flaws demanded by Old Man Time, something that *was* tried (mostly by jazzy, blaring, up-tempo creations) on several albums *before* retirement. Instead, the record stands as a monument of sorts to the greatness of a singer whose absence could not be filled by any other. Come to think of it, the LP's nine cuts do not really consti-

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tute a comeback at all; they're a lesson that the master was never away.

Or, maybe, boss, I should deal with the fag-drag-glitter-ghoul trend in rock, including ***Lou Reed's*** **Berlin** (RCA, APL1-0207) and ***Alice Cooper's*** **Muscle Of Love** (Warner Bros., BS 2748). The first is a cornucopia of decadence, a disgusting melange that out-Tennessee's Williams. Reed, who tosses in a multitude of non sequiturs and an occasonal bit of bizarre humor for flavor, perhaps sums up his real feelings in *Men of Good Fortune*. Says the main character, "Me, I don't care about anything at all." The LP is depression personified, with depravity to spare. Cooper, on the same hand, is a refugee from Maliceland, even though he adds "nice" background vocals this go-round by Liza Minelli on *Teenage Lament '74* and *Man With the Golden Gun*. There are good changes-of-pace, from slow to hard rock, but the emphasis, as always with the guy whose legendary stage act included mutilation of baby dolls, a 13-foot boa constrictor and mock hanging or guillotinings is freak rock. As distasteful as recordings are, however, they're sure to add some gold to the glitter-boys.

More to my liking, boss, might be a column based on humor in music, or, in the case of **10 C. C.** (UK-London, UKS 53105), humour in music, since the latest protegés of Jonathen King are veddy definitely British. The quintet, which spoofs Top 40 and bubblegum rock tunes (as in their sleeper hit, *Rubber Bullets*), almost does in the entire genre, with the emphasis on parodying early '60s material. *Johnny Don't Do It* is a marvelous pastiche of motorcycle death melodies, as a case in point. Trouble is the stuff has to be heard to be appreciated; words on paper eliminate the verve and the fun.

Or, boss, should I deal with professionals who lose the ability to communicate what they feel, as with ***Kris Kristofferson*** and ***Rita Coolidge*** on **Full Moon** (A&M, SP 4403)? Each of the two, individually, had no difficulty letting the audience know, nay feel, exactly what was in their minds and hearts. Now that they're blissfully wed, however, there's a block—unless the listener is in a similar state of ecstasy. The dozen cuts here might be described as country mush, an exercise in double ennui despite the presence of Mike Utley, Lee Sklar, David Bromberg, Nick DeCaro, Gary and Randy Scruggs, Booker T. Jones and Herb Alpert as instrumentalists. Even the highlights, *Hard to Be Friends* and *I Never Had It So Good*, both of which are getting a fair share of airplay, don't equal any of their individual performances.

Then, of course, I might be able to do something with a trio that's growing geometrically, (Keith) ***Emerson,*** (Greg) ***Lake &*** (Carl) ***Palmer.*** **Brain Salad Surgery** (Manticore, MC 66669) is on the menu, and the eight cuts provide a digestible, exciting combination of heavy electronic rock and strains of classics, not unlike some of the stuff Emerson had done with The Nice (except that it's more complicated, more interesting, more original now). The vocals tend to be poetic, except for the gruff *Benny the Bouncer*, but it's the music that stops the audiophile in his tracks. If you must choose one selection, and that's a difficult task, try *Toccata*, a fascinating item developed from Ginastera's *First Piano Concerto, Fourth Movement*.

Still another alternative, boss, is to do a bit about newcomers, such as ***Billy Joel*** on **Piano Man** (Columbia, KC 32544), which features good rock piano, good vocals and a together sound that equals, as a debut LP, early Carole King. The title tune is the winner, with a harp-like blues backdrop blending exquisitely with lines such as "They share a drink they call loneliness/But it's better than drinking alone." Another success is the schmaltzy, Hugo Winterhalter-like but oddly memorable *Ballad of Billy the Kid*.

Or, I could do a column *without* a theme, much like this one, hop-scotching the world of pop and rock, combining bits and pieces of a dozen kinds of material. Just a line or two on each disc. Such as—

Millie Jackson's **It Hurts So Good** (Spring, SPR 5706) offers a dozen cuts including two instrumental reprises (*Hypocrisy*, her own tune, and *Breakaway*). The soul singer, a future star, has a crusty voice with a feel of suffering that clearly comes through your amplifiers. Best tune on the Polydor-distributed vinyl is *I Cry*, a bluesy, bluesy piece aided by good instrumentation, particularly the wah-wah pedal.

Rod McKuen, who sounds, as always, as if he's just getting over a cold but still has a sore throat, spotlights other people's material on four entries on **Cycles** (Buddah, BDS 5138); the other eight tunes are his. The pop-poet with the raspy voice is duly sad and pretty on the title tune, and many of the others, but the standout cut is *Love Child*, a highly personal tone poem to his own bastard beginnings, a recitation set to bland background music.

Davey Johnstone, who joined Elton John in early '72 debuts as a solo on **Smiling Face** (Rocket Records, 340) and

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manages to climb mediocrity. The album, carrying John's own label, is mostly soft rock, with Johnstone singing and playing electric piano, mandolin, harmonium, dulcimer, sitar, banjo and electric and acoustic guitars. In addition, he wrote all but one of the dozen tunes. Highlights of the MCA-distributed disc, if they really can be termed that, include *The Boatman*, a reggae; *Walking Out*, a honky-tonk success; *After the Dance*, an instrumental with some good guitar work, and *A Lovely Day*, with a lead vocal by Di Johnstone, his old lady.

Burt Reynolds can remove the staple from his navel and use it to play his album, **Ask Me What I Am** (Mercury, SRM-1-693), for the more copies he destroys, the better off the public is. There are 11 songs, eight specifically penned for the actor; on all of them, he half-talks, half-sings in the style originated by Rex Harrison years ago in *My Fair Lady*. Harrison was better, even though he didn't have unbilled Dinah Shore backing him on *I Like Having You Around.*

I'm a Writer, Not a Fighter (MAM-London, MAM7) finds 26-year-old singer ***Gilbert O'Sullivan*** doing a lot of his own things that sound too much like past smashes, particularly *Clare* and *Alone Again (Naturally)*. Witness *Get Down* from this album, a hit despite the musical mirror phrases, or *A Friend of Mine, They've Only Themselves to Blame* and *I Have Never Loved You As Much As I Love You Today*. Imitation may be the sincerest form of flattery, but is it really necessary to flatter yourself?

Mississippi (Fantasy, F-9438) is the album's name *and* the name of the three-man Australian group starring on it. Russ Johnson, lead guitarist; Graham Goble, rhythm guitarist, and John Mower, drummer, do a BeeGee-like job, combining ballads and soft rock to a faretheewell. All three sing nicely, offering think-rock with folk overtones. The pleasant result is best noticed on *Kings of the World*, a song that won the Aussie equivalent of the Grammy; *Save the Land*, an ecology-based thing with excellent harmony; and *Sweet World*, a blues.

Pacific Gas & Electric Starring Charlie Allen (Dunhill-ABC, DSX-50157) brings country-rock to the fore (with touches of blues, soul and folk tossed in). The group has reorganized, but is not as good as the original. Of the 11 cuts, *Hold On*, a bouncy rocker, shines. The rest, whether emphasizing country or gospel or bluegrass or whatever, don't carry that much weight.

Angel Clare (Columbia Quadraphonic, CQ31474) proves that ***Garfunkel*** (he's shed the Art) *can* go it alone, sans Paul Simon's lyrical lovelies (despite Simon doing some backup work on the LP, along with Jim Gordon and Jerry Garcia). Garfunkel continues valid use of his choirboy voice and continues musical patterns that are reminiscent of the S&G blockbuster, *Bridge Over Troubled Water*. Best of the bunch are *I Shall Sing*, a catchy pop tune with a Latin-calypso beat worthy of hitting the charts; the traditional folksong, *Barbara Allen*, and *All I Know*, already a smash single. It's a *pretty* LP, aided by songs by Paul Williams, Van Morrison, Randy Newman and Jimmy Webb.

Boogie Woogie Bugle Girls (Paramount, PAS-6075) owes a debt to Bette Midler, who almost single-handedly brought back the sound of the ***Andrews Sisters.*** This, with the original Patti, Maxene and LaVerne version of *Bugle Boys* intact, shows that the '40s really did have some life to them (though these 14 cuts were done only a dozen years ago, to improve the sound quality via stereo). Highlights by the singing Andrews include *Rum and Coca Cola, Beat Me Daddy Eight to the Bar, In the Mood, Don't Sit Under the Apple Tree (With Anyone Else But Me), Old Piano Roll Blues, Bei Mir Bist Du Schon, Oh Johnny, Oh Johnny, Oh!, Pennsylvania Polka* and *Pistol Packin' Mama.* Memories, as the lyric goes, are made of this.

Food of Love (MCA-356) is schlock, pure and simple, from the ordinary voice of ***Yvonne Elliman.*** At best, it's good background music (despite the presence of Peter Townshend and Caleb Quaye on guitar). Best cut is Townshend's *I Can't Explain*, a rocker. Ms. Elliman wrote one of the 11 cuts, *Hawaii*, and that lacks luster too.

One Live Badger (Atco, SD7022) showcases a quartet that offers rock as hard as diamonds. Six cuts comprise the LP, recorded live at the Rainbow Theatre in 1972. Brian Parrish stands out, occasionally, with his lead guitar. There are times, be warned, that the music approaches a decibel count sure to deafen.

Imagination (Buddah, BDS 5141) begins with the hit single, *Midnight Train to Georgia*, a good combination of blues, soul and pop. Another sparkler by ***Gladys Knight & The Pips*** is a healthy rendition of *I Can See Clearly Now*. It's basic, soft soul with little of the screaming that dots most LP's by Black groups.

Isleys' Greatest Hits (T-Neck, TNS 3011) puts the Brothers into a

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fitful rhythm 'n' blues bag . . . or is it soul? . . . or is it pop? No matter. It's good, it's exciting, spirited and exhilarating. Includes *Shout* and *It's Your Thing* and *Love the One You're With.* Atlantic distributed the money-saving anthology, and we should be grateful.

Childgrove (Adelphi, AD1022) provides cerebral music by ***Suni McGrath.*** The composer-guitarist (who excels on six *and* 12-string instruments) offers a soft classical orientation with folk overtones. Side Two is one tremendous 22-minute track, *Lion of Judah*, with a short vocal by Ellen Matthews at the tail.

Fillet of Soul (Stax, STS-3021) is an anthology that causes the blood to circulate faster. Best of the dozen cuts are *Never Can Say Goodbye* and *The Look of Love,* soul-pop hits by the Black Moses, ***Isaac Hayes;*** *Watcha See is Watcha Get*, another hit by the ***Dramatics,*** and *Starting All Over Again,* an oldie chartbuster by ***Mel and Tim.*** Others performing are the ***Staple Singers,*** the ***Bar-Kays, Frederick Knight, Johnnie Taylor, Rufus Thomas, Mavis Staples,*** and ***Little Milton.***

The Best of Procul Harum (A&M, SP-4401) contains four tunes (three in mono) never before released in America in album form, *Lime Street Blues, Homburg, In the Wee Small Hours of Sixpence* and *Long Gone Greek.* But for those who've followed the cult-like successes of the rock group, highlights must be *A Whiter Shade of Pale* and the orchestra-backed *Conquistador.*

JANIS JOPLIN'S GREATEST HITS (Columbia, KC 32168) allows us to mourn while reveling in her greatness. It's the hardest of blues and rock, 10 cuts worth; four are with Big Brother and the Holding Company, one with Kozmic Blues Band, the rest with Full Tilt Boogie Band. Sit back and enjoy the likes of *Piece of My Heart, Summertime, Try (Just a Little Bit Harder), Me and Bobby McGee, Down on Me, Bye Bye Baby* and *Move Over.*

JONATHAN LIVINGSTON SEAGULL (Dunhill-ABC, DSD-50160) is a narration of the utopian book by ***Richard Bach;*** delivery is via the resonant voice of ***Richard Harris,*** whose talent outshines the words he speaks. Music was composed, arranged and conducted by Terry James, who must have had something better to do with his time. Strictly for Norman Vincent Peale addicts. Personally, I think the company had a lot of gull to release it.

FRAMPTON'S CAMEL (A&M, SP-4389) is a quartet fronted by ***Peter Frampton,*** who left Humble Pie after three years to do his own thing. He's probably one of the most underrated performers extant, but it takes a couple of hearings to determine just why: subtlety. There are nine easy rock offerings, all but one by the singer-writer (who, not incidentally, approaches being a one-man band by playing piano, organ, guiter, tambourine, drums and percussion, and bass).

CHAPTER VII (Columbia, CQ 32048) provides rock 'n' soul by the ***Buddy Miles Band.*** The quadraphonic recording is screamin' stuff, topped by some exquisite guitar work. Miles proves his mettle on organ, guitars, bass, drums and vocals (the last being his weakest suit), and is backed by his six-man group and eight other musicians. There are nine listenable cuts, including the two-part *Life Is What You Make It* that is the standout.

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Jazz & Blues

Martha Sanders Gilmore

RAHSAAN ROLAND KIRK: Prepare Thyself to Deal with a Miracle

Musicians: Rahsaan Roland Kirk, clarinet, nose flute, flute, black mystery pipes, baby E flat sax, tenor sax; Charles McGhee, trumpet; Dick Griffin, trombone; Harry Smiles, English horn, oboe; Ron Burton, piano; Henry Pearson, bass; Robert Shy, drums; Sonny Brown, percussion; Ralph MacDonald, percussion; Selwart Clarke, violin; Sanford Allen, violin; Julien Barber, violin; Gayle Dixon, violin; Al Brown, viola; Kermit Moore, cello; Jeanne Lee, vocals; Dee Dee Bridgewater, vocals.

Songs: *Salvation and Reminiscing; Seasons; Celestial Bliss; Saxophone Concerto.*

Atlantic SD 1640, $5.98.

The material on this recording, all composed and arranged by Rahsaan Roland Kirk, lies somewhere in the midst of that experimental gray area between classical music and jazz. Thus it is difficult to describe or characterize.

Kirk, the mighty miracle worker is here in all his splendor, playing on a menage of instruments simultaneously and moving *breathlessly* through the movements of his creations. Take for instance *Saxophone Concerto* in which Kirk plays a 21-minute tenor saxophone solo without even once taking a breath until its completion—sheer mastery of an instrument that will leave you breathless. Set against a backdrop of horns and percussion, the movements of the concerto are as different one from the other as night from day and encompass "all levels and progressions in Black Music (Swing, Bebop, and Now)." The first movement, *Saxophone Miracle*, begins with a train whistle which the instruments immediately take up and imitate. A fast walking bass under the aegis of Henry Pearson then sets forth alongside Kirk's gut-filled tenor playing. A cymbal crashes. Kirk loses himself amid his churning whirlpool of motion. The train passes on.

In the second movement, *One Breath Beyond*, Kirk plays his sax front on, then it is as though he wheels around, turning his back upon us for the saxophone sounds faint in the distance. Suddenly he breaks into a snappy polka which is great fun as pitted against Ron Burton's piano. It is undoubtedly the highlight of the album. Kirk, flying along as fast as his wind will carry him, shows off his cognizant technical skills, taking one's breath away once again.

Never actually putting down his horn he glides into *Dance of Revolution*, the third movement of the *Saxophone Concerto*, leading us on a merry fox and hounds chase that admittedly oversteps its mark. There is essentially too much repetition. The train chugs by, stops. We hear footsteps walking away. Then it is as if someone drops a long string of bells. They clink to the floor. (If all this sounds experimental, it is).

Salvation and Reminiscing opens with Kirk's lovely lush-toned clarinet which he takes to piercing heights alongside plucked strings and timpani. There is a propelling forward motion to this, a majesty.

Seasons begins with an English round or folk tune, Kirk playing flute and nose flute at the same time. Over the great rolling surge of it all he plays quick, darting flute trills after which Ron Burton's piano solos against Henry Pearson's pivotal bass. It must be said here again that Kirk and crew go to interminable lengths without much happening.

Celestial Bliss, with Kirk on E flat sax and "black mystery pipes," is played to a Calypso beat as he sets down a single note on one horn over which he imposes his lacework via the other.

The recording is by and large well produced although at times Kirk's backup group is too loud for him.

So if you like to experiment I think you will get something out of this recording by Rahsaan Roland Kirk. He is a musician through and through and will breathe life into you.

Performance B+ Sound B+

DUKE ELLINGTON PRESENTS IVIE ANDERSON

Musicians: Arthur Whetsol, trumpet; Cootie Williams, trumpet; Freddie Jenkins, trumpet; Joe Nanton, trombone; Lawrence Brown, trombone; Johnny Hodges, alto, soprano saxophones; Harry Carney, alto, baritone saxophones; Barney Bigard, clarinet, tenor sax; Duke Ellington, piano, arranger; Freddie Guy, banjo, guitar; Wellman Braud, bass; Sonny Greer, drums; Juan Tizol, valve trombone; Otto Hardwicke, alto, bass sax; Joe Garland, tenor sax; Rex Stewart, cornet; Ben Webster, tenor sax; Billy Taylor, bass; Hayes Alvis, bass; Pete Clard, alto sax; Wallace Jones, trumpet; Harold Baker, trumpet; Billy Strayhorn, vocal, Jimmy Blanton, bass.

Songs: *It Don't Mean a Thing; Delta Bound; Happy As the Day Is Long; Raisin' The Rent; Get Yourself a New Broom, I'm Satisfied; Truckin'; Isn't Love the Strangest Thing; Love Is Like a Cigarette; Kissin' My Baby Goodnight; Oh Babe, Maybe Someday; Shoe Shine Boy; It Was a Sad Night in Harlem; I've Got To Be A Rug Cutter; There's A Lull in My Life; It's Swell of You; Alabamy Home; All God's Chillun Got Rhythm; If You Were in My Place; Swingtime in Honolulu; You Gave Me the Gate; Rose of the Rio Grande; When My Sugar Walks Down the Street; I'm Checkin' Out, Goombye; In a Mizz; A Lonely Coed; You Can Count on Me; Your Love Has Faded; Killing Myself; Solitude; Stormy Weather; Mood Indigo.*

Columbia, KG 32064, $9.98.

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That Ivie Anderson was the most distinguished vocalist to ever front the Ellington Orchestra is an undeniable fact. Those who followed in her footsteps attempted to emulate her but could never quite fill her shoes or reach the rare heights she had attained during her twelve-year reign with the band from 1931 to 1942. Ivie left the band to open a restaurant in California and subsequently died of asthma in 1949, a malady she had suffered during her stint with the band. But in spite of that she sang, oh how she sang!

The thing that strikes one most, I suppose, from listening to this two-record collection of Ellingtonia recorded between 1932-1940 is the immense dignity of Ivie's delivery, the way she takes total command of a song and wields it into shape. Recalled Harry Carney: "Ivie always came on stage dressed in white, looking angelic, very chic and above it all. Yet backstage and on the bus, in hotels or restaurants, everywhere, she was always regular one hundred percent. With the boys, with the girls, with Ellington, everyone. There was no side to her. She had no fancy ways."

Ivie's voice, which lies well within the alto range, has a glassy edge to it that is able to penetrate and soar above the most sophisticated and elaborate of Ellington's orchestrations. She had a keen sense of timing, her diction was absolutely faultless, and her use of dynamics was both provocative and intelligent. In addition, she was able to sustain a note at a phrase ending in such a subtle way that one could never hear her actually put a period to it. It just kind of tapered off. Her vocal delivery was ultra-smooth and ripple-free. But above it all was Ivie's seemingly effortless style, her very natural manner of attacking a lyric illustrated here in *It Don't Mean A Thing If It Ain't Got That Swing*, an anthem of the Swing Era, all the way to *Mood Indigo*, a perennial classic.

These recordings contain many Ellington originals—some of his better known compositions such as *Solitude* which features tenor saxophonist Ben Webster in some throaty embellishments and the *Piano Player*, Ellington himself playing glistening descending runs, to lesser known tunes out of the Ellington notebook such as *A Lonely Coed* in which Ivie curls about the tune with sheer poignancy against Cootie Williams' muted trumpet lines.

There are also songs by other American songwriters of the highest order such as Harold Arlen's *Raisin' the Rent*, *Happy As the Day Is Long*, and *Get Yourself a Broom*, all infectiously humorous, to Harry Revel's breezy *There's a Lull In My Life*.

And there are crackerjack solos by the very best soloists the Ellington organization had to offer during this twelve-year era of Swing. We are treated to Bunny Bigard's merrily simmering clarinet work in *Truckin'*, *Isn't Love the Strangest Thing*, and *Kissin' My Baby Goodnight*, while Cootie Williams plays a muted trumpet that growls its way through *It Was a Sad Night in Harlem* wherein Johnny Hodges evokes a pervasively bluesy feeling on alto saxophone, then submits a protracted statement in *If You Were In My Place*. Solos by other Ellington stars abide as with Rex Stewart, Joe Nanton, and Lawrence Brown who does some elegant trombone work.

Tenorman Ben Webster plays blissful obbligati under Ivie's *Stormy Weather*, a vehicle that is perfectly suited to her voice. And Ivie's rendition of *All God's Chillun Got Rhythm* is absolutely spellbinding. She gives it a grand treatment together with Her Boys from Dixie.

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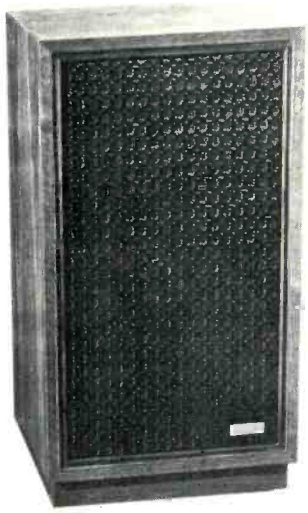

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Despite the early years when these tunes were actually first recorded on labels like Brunswick, the sound is remarkably free of static and bumps and Columbia wisely did not rechannel them to simulate stereo.

That Ivie Anderson was an artist extraordinaire, there is no mistaking. She will ever remain a timeless performer. At the 1972 Newport Jazz Festival Bobby Short payed a tribute to her by singing some of the songs associated with her. Short testifies about Ivie: "Like Gertrude Lawrence, she could sing the worst songs in the grandest way. Hers was a rare gift. She was a popular singer who listened to the lyrics, and stayed within the character of the song. She was my favorite singer—not only then, but for all time."

When you hear this, you may agree with Bobby.

Performance A Sound B

KLAUS DOLDINGER: Passport
Musicians; Klaus Doldinger, tenor saxophone, soprano saxophone, Moog synthesizer, electric piano; John Mealing, organ, electric piano; Bryan Spring, drums; Wolfgang Schmid, bass guitar, electric guitar.
Songs: *Mandragora; Nexus; Fairy Tale; Get Yourself a Second Passport; Lemuria's Dance; Madhouse Jam; Horizon Beyond; The Cat from Katmandu.*
Reprise MS 2143, $4.98.

Klaus Doldinger's pre-eminence among European musicians is well borne out in this very excellent recording which is actually an amalgam of two of his former LP's. And his credentials earned at the conservatory at Dusseldorf where he formally studied clarinet, piano, and conducting vibrantly emerge in this collection. The group met with great success at their debut last year at the international festival held in Ljubljana, Yugoslavia.

Seven of the eight tunes included here are Doldinger's own compositions, the eighth, *Fairy Tale*, is traditional and adapted by Klaus. While the music itself falls into no one single category it spans several, namely jazz, folk, classical, straight unlaced rhythm and blues, but *primarily* rock. Doldinger is looked upon as an expert on traditional jazz, composes and produces pop material as well as composing and playing music for TV, commercials, and films. Comments this talented jack-of-all-trades: "A musician must be able to play anything, and still know his limits."

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It is clear upon listening to this 42 minute, 32 second long LP—certainly your money's worth—that Doldinger *can* play anything. We hear him here on a potpourri of instruments which include tenor and soprano saxophones, Moog synthesizer, and electric piano. The remainder of his group which together comprise a very together unit includes John Mealing, organ and electric piano, Bryan Spring, drums, and Wolfgang Schmid, bass guitar and electric guitar.

Mandragora is definitely the sound of today, a deliberate and authoritative number that features Doldinger on a low-born tenor saxophone with a strong assist by drummer Spring. It is of great interest dynamically. There is much going on in *Nexus* which has Klaus on soprano saxophone in a call and response pattern with Wolfgang Schmid on electric bass and wah-wah. The seemingly indefatigable group sets up a virtual madhouse of rhythm.

Fairy Tale is a pretty tune with a mystical, poetic quality about it in which Doldinger whisks us away on his magical musical carpet. He achieves a very lovely open tone on soprano saxophone, using the echo machine to great avail and thereby playing a duet with himself, allowing his sound to fade away into the distance, then return. Doldinger also plays some well-placed notes on electric piano.

The foursome sets up a turbulent rhythm in *Get Yourself a Second Passport* with Doldinger creating a French horn-like effect on saxophone. As if from a House of Horrors comes *Lemuria's Dance* with its shimmying, neighing, swarthy sound. Schmid puts down a period to it all with a bone-dry bass thud.

Doldinger and crew take us a step beyond in *Horizon Beyond* which is piloted by Spring's rushing drums and Schmid's dancing bass. John Mealing plays a punchy organ solo aided and abetted by wah-wah and Doldinger plays a jazz-prone soprano saxophone. In *The Cat from Katmandu*, a raunchy rhythm and blues, Doldinger effects a raspish tone on tenor.

Although the album doesn't state it anywhere, one assumes Doldinger is taking the lead on flute in *Madhouse Jam* against Mealing's crashing organ. Unfortunately, however, the flute does not penetrate as well as it should and I encountered some surface noise on the beginning of this side as well.

There is no singing in this recording. It is purely instrumental and a mesmerizing experience to listen to indeed.

Performance A Sound B

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