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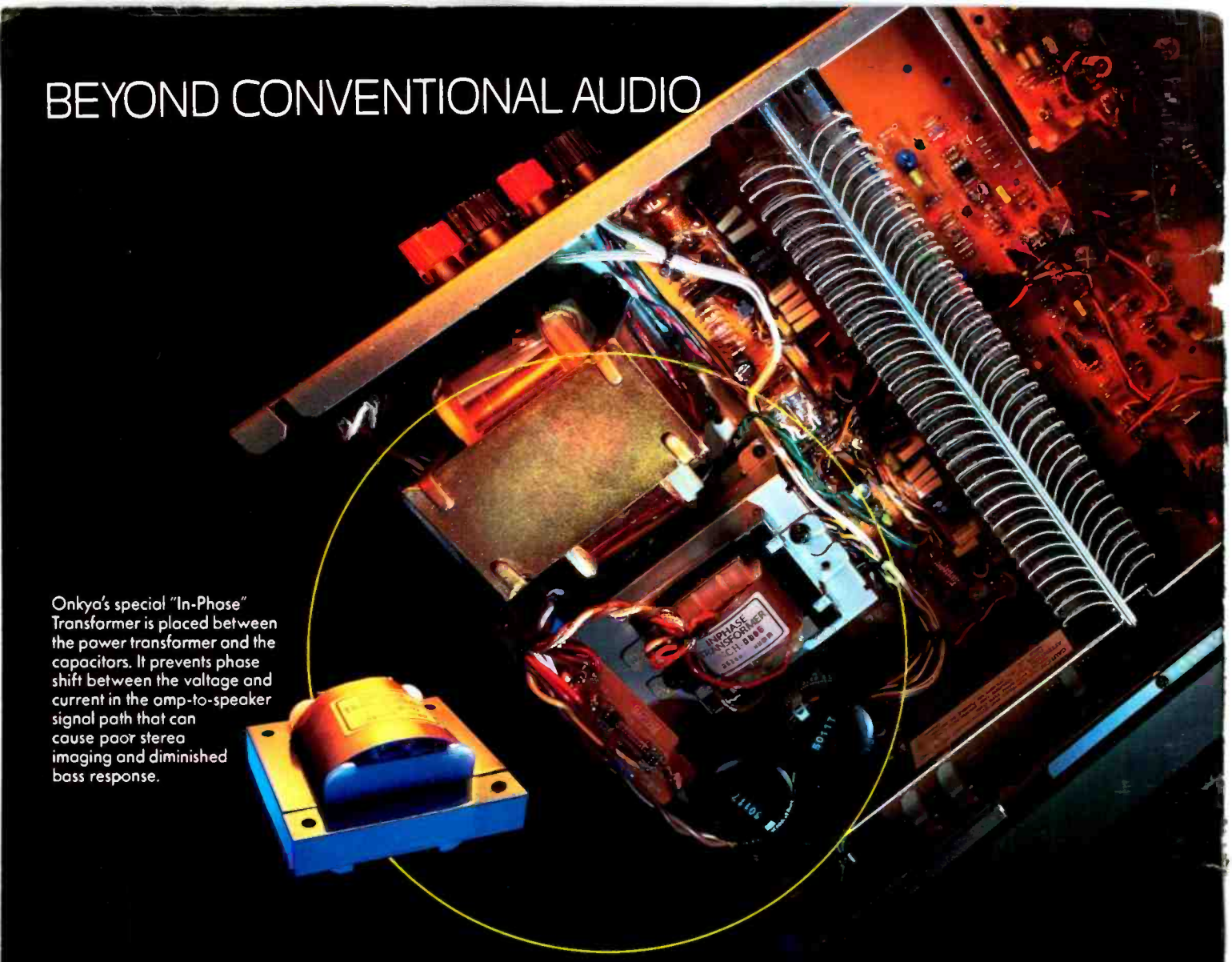

Onkyo's special "In-Phase" Transformer is placed between the power transformer and the capacitors. It prevents phase shift between the voltage and current in the amp-to-speaker signal path that can cause poor stereo imaging and diminished bass response.

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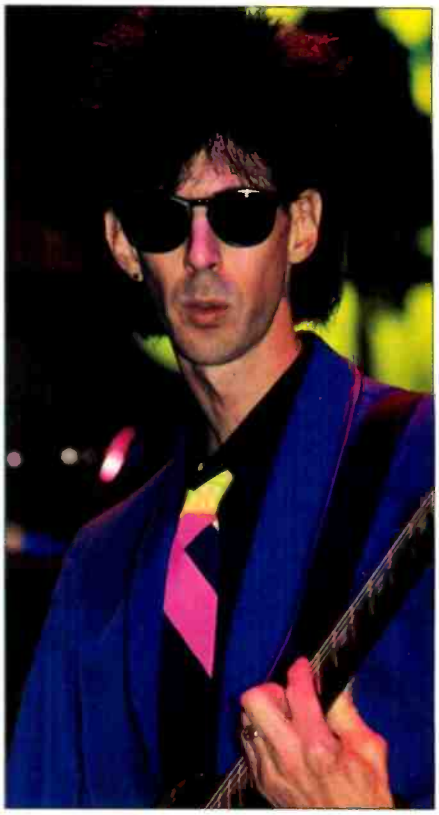

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FEATURES

EQUIPMENT PROFILES

MUSIC REVIEWS

DEPARTMENTS

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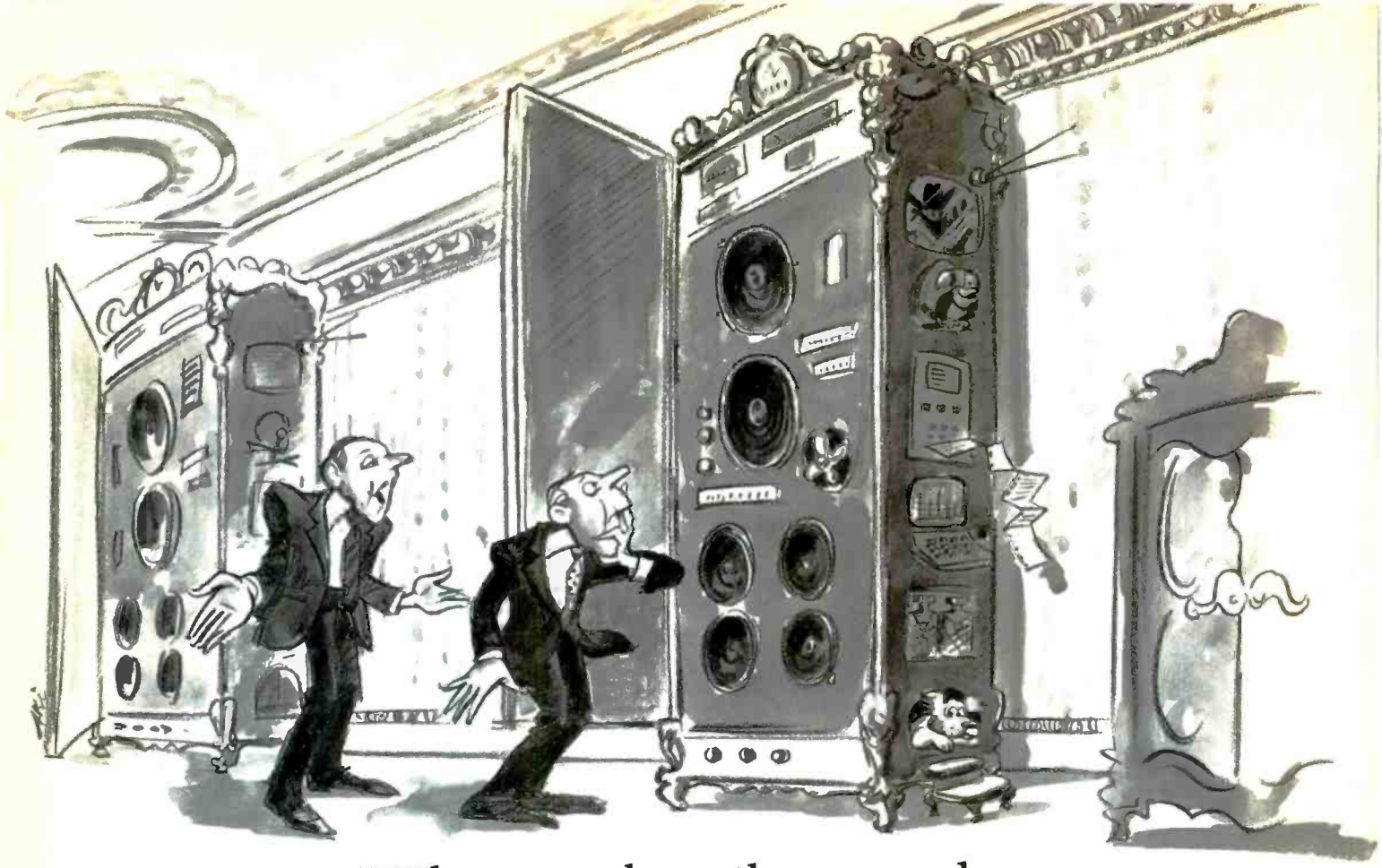

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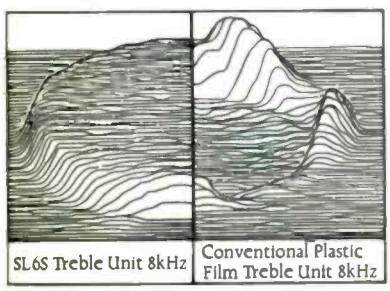

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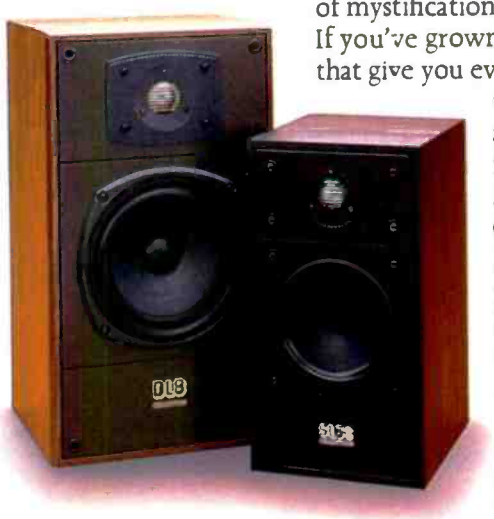

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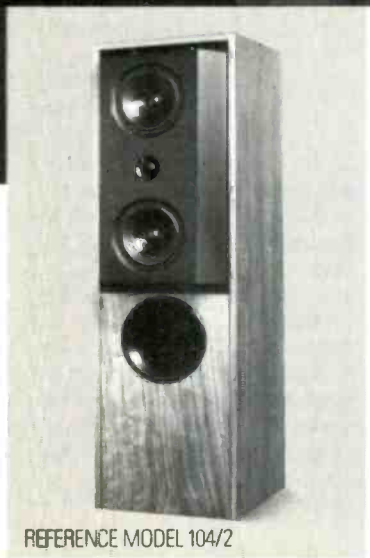

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TAPE GUIDE

HERMAN BURSTEIN

Which Way to Dub?

Q. I have two cassette decks. When I dub tapes by playing deck A and recording on deck B, the signal output is pretty strong. But if I record from B to A, the resulting tape is not very satisfactory. What is wrong?—Paul Wollerman, Sacramento, Cal.

A. The strength of the output signal tends to vary from one brand and model of tape deck to another. Typically it is about 0.5 V at maximum signal level, but it can go down to as little as 0.25 V and up to as much as 1 V or slightly more. This may explain the difficulty you are having. If your deck B has an output level control, it should, of course, be set to maximum. Inasmuch as you are able to get satisfactory results when recording from deck A to deck B, why don't you just stay with that arrangement?

Buzz Words

Q. My cassette deck is a fine machine, except that when I play tapes I hear a buzz in one of my loudspeakers. I switched the speaker wires on my receiver and then heard the buzz through the other speaker. I don't hear the buzz when playing radio or phono. Any suggestions?—Greg David, Holmdel, N.J.

A. Since you only hear the buzz when playing tapes, the trouble probably lies in the deck or in the cables connecting it to the rest of your audio system. It may merely be caused by dirt or corrosion on a plug or jack; with the receiver's volume turned completely down, try unplugging both ends of the offending channel's cable, and then plug them back in—twisting each plug slightly as you put it back into the jack. This may either cure the problem or worsen it. If the latter, replace the cable.

If replugging has no effect, try plugging the left-channel cable into the receiver's right-channel input, and vice versa. If the buzz now appears in the opposite speaker, this absolves your receiver and speakers. Next, switch the cables' other ends, shifting one cable from the tape deck's left output to its right one, and shifting the other cable to the left-channel output jack. If the buzz stays in the same channel, the cable should be replaced. If the buzz changes channels when you do that, the tape deck is at fault and should be taken to a qualified service shop. The problem could be in the playback head, the power supply, the internal wiring, or the playback electronics.

Playback Equalization for Nonferric Tapes

Q. I use Type II and IV tapes, with appropriate record equalization and bias. But in playback, the music always sounds cleaner when the setting for equalization is in the "Normal" position. Will I damage my deck if I continue this practice?—Kirk L. McDonald, New York, N.Y.

A. Using 120-μS ("normal") playback equalization results in moderate treble boost when playing Type II and IV tapes that have been recorded for playback with 70-μS equalization. This treble boost eventually reaches about 4.4 dB at 20 kHz. The effect, to your ears, is apparently to make the sound "cleaner"; some might say "airier." No damage whatsoever will be done to your deck or tapes as a result of this practice. The burden on the tweeters of your speaker system will be increased but probably not dangerously so, unless you operate at very high levels.

Meter Mismatch

Q. I have noticed that the output level shown by my cassette deck's LED meters is somewhat lower than the input level they show. For example, if I record on chrome tape at +1 dB, as recommended by the instruction manual, in playback the indicated level is around −3 dB. Is this normal, or do I have a problem? I have tried various kinds of tape, but this has not provided a solution. Friends have suggested that I may be saturating the tape, but I encounter the same situation when recording at lower levels. Another suggestion is that my use of Dolby C NR causes the output to be suppressed. Is there any truth to this?—Steven Woodroof, Bedford Park, Va.

A. Possibly, your deck's manufacturer used a tape with extra-high sensitivity when making playback-meter calibrations. In such a case, tapes with average sensitivity would tend to read low in playback. A more likely explanation is that the meters are miscalibrated, either in recording or in playback, or both. That is, they may be adjusted to show too high a level in recording—which does have the advantage of protecting against overrecording, with consequent tape saturation leading to distortion and treble loss—or too low a level in playback, or some of each.

Another explanation is that the meters may reflect the input signal *after* record equalization, which adds a substantial amount of treble boost. Depending on the type of program material, this treble boost may significantly affect the indicated input level.

I doubt that the situation has anything to do with Dolby noise reduction. Fortunately, your problem is not a serious one, and should not be difficult to live with.

Why Not AFM?

Q. I have read about the great frequency response and signal-to-noise ratio that Hi-Fi VCRs achieve by means of AFM (audio-frequency modulation). Could this system be used in regular cassette decks?—Tony Perkins, Los Angeles, Cal.

A. A frequency-modulation system, if it is to achieve a signal-to-noise ratio commensurate with high fidelity, must have a bandwidth of several hundred kHz. Such bandwidth is available in a VCR, which goes out to several MHz, whereas the bandwidth of an analog cassette deck is in the neighborhood of only 20 kHz.

Unknown Tapes

Q. I have obtained a number of open-reel tapes, many of them no longer in their original boxes. Since I cannot identify them and therefore am not sure of their quality, I don't know whether to use them; I don't want to risk damaging the deck. Is there any way of identifying the brand and type, or at least the quality, of recording tape of unknown manufacture?—Russell L. Kallen, New York, N.Y.

A. I do not know of any way to identify tape by brand. You can check for quality by using the tapes and noting

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

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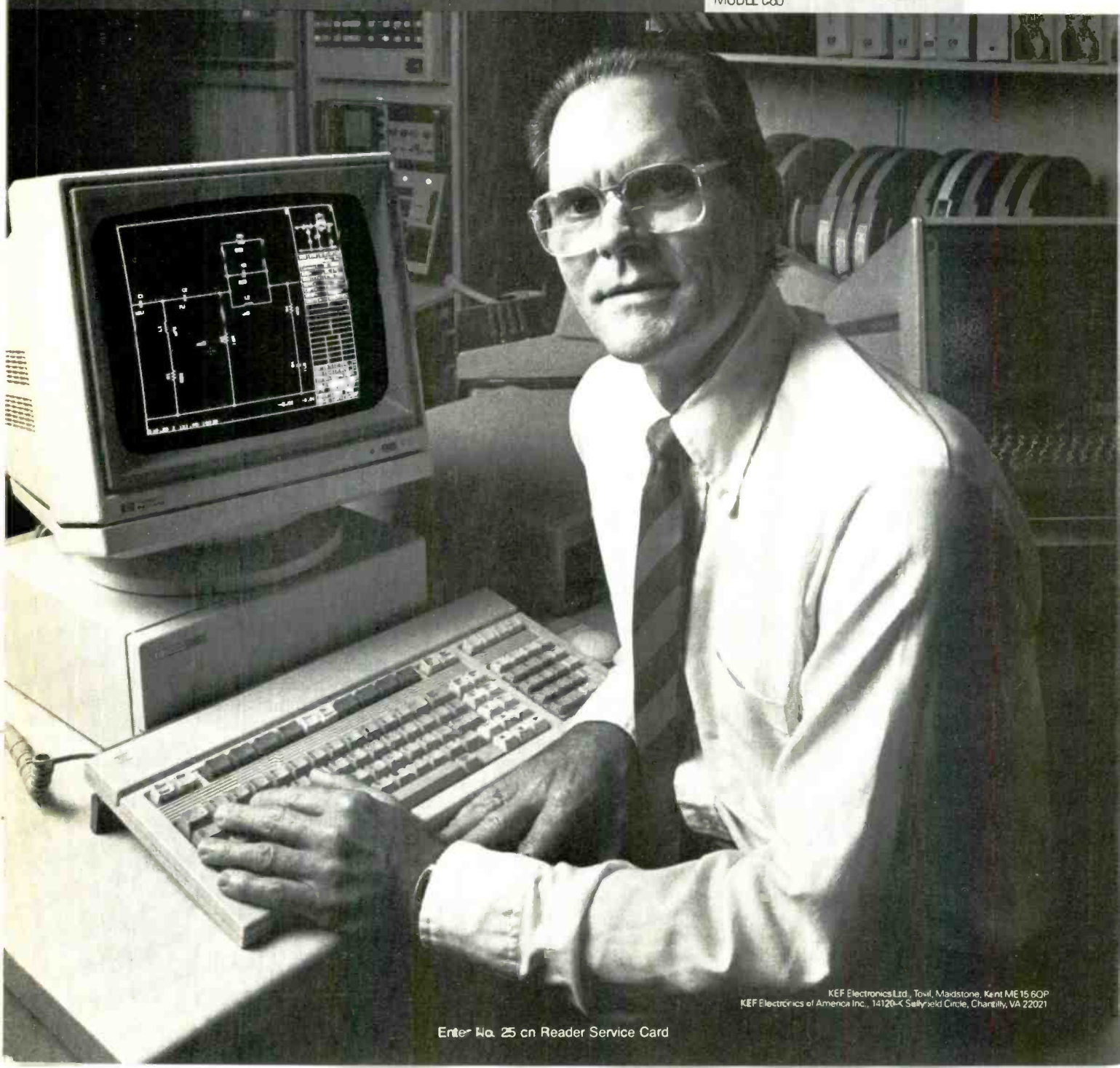

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LED record-level meters are better at responding to signal peaks, while VU meters can indicate finer differences in recording levels.

how faithfully they reproduce sound. A tape cannot hurt the deck if it falls short in terms of electronic performance—that is, if it exhibits high distortion, poor signal-to-noise ratio, or inadequate frequency response. There is also probably no chance of hurting your deck if a tape falls short mechanically, if you play a reel only partway through to see how it performs. If there is squeaking, it is likely that the tape is not well lubricated, and it should not be used. Also, check for excessive oxide shedding on the heads, capstan, pressure roller, etc. If you see this, the tape should not be used.

Record Level Imbalance

Q. When I am recording from FM or phono, one of the meters of my tape deck usually reads 3 or 4 dB lower than the other meter. Should I use the deck's balance control so that the meters give the same reading? Or should I keep the balance control in the middle position?—Ted Wirth, Cleveland, Ohio

A. There may be a problem in your record gain control or in the calibration of your record level meters. Or there may be no problem; it may simply be that there is imbalance between the two channels of the signal source.

To determine whether your record level indicators are out of balance, feed the same signal—say, interstation FM noise—into both channels of your tape deck. Adjust gain on each channel, with the aid of the balance control if necessary, so that the reading is the same on each indicator as you record. Play the tape with the playback gain controls (if any) at maximum, and check by ear whether the levels of the two channels are approximately even. If there is a decidedly noticeable difference, this suggests that one of the indicators is not properly calibrated. Through trial and error, you can ascertain how much mental compensation is needed in reading that record level indicator. If the record level indicators are not miscalibrated, use the balance control to achieve equality between channels when recording, provided you are pretty sure that the signal source requires balance.

All the foregoing assumes that the outputs of your tape deck are of equal level when the recorded signals on the two channels are equal. To check this, a test tape would be desirable. In the absence of a test tape, try using a prerecorded tape or perhaps a tape recorded on another deck known to be of high quality.

Record-Level Indicators

Q. Which are better record-level indicators—VU meters or LEDs? What do the terms peak, peak-hold, and averaging mean in relation to level indicators? What purpose is served in having a VU meter along with a peak-type LED? In setting the record level to utilize all of the available headroom, what is meant by setting the indicator so that it peaks at the midrange 3% distortion point, and where is this point located on a VU or LED scale? What does "meter resolution" mean?—Edward Brown, Far Rockaway, N.Y.

A. I tend to prefer LEDs because, being electronic rather than mechanical, they can immediately and fully respond to signal peaks. This helps guard against recording at excessive level, with consequent distortion and treble loss. On the other hand, the VU meter is more helpful in enabling one to discern fine differences in recording level. The true VU meter is an averaging device; it reads average signal level, which can be as much as 10 or even 20 dB below sharp peaks. There are also peak-reading meters, which pretty faithfully follow sharp transients. A peak-hold meter will stay at the peak level for a brief period so that the eye can follow it.

Considering the inability of a true VU meter to follow signal peaks, its indications have to be interpreted, and one's interpretation may be incorrect. A true VU meter is usually calibrated so that 0 VU corresponds to about 1% harmonic distortion. This provides a safety margin of about 6 to 8 dB with respect to the 3% harmonic-distortion level, which is generally considered the maximum compatible with high-fidelity reproduction. That is, when the meter reads 0 VU, the peak signal level may be about 6 to 8 dB higher, producing about 3% distortion. But with some signals, the peak level may be a good deal higher still, so that interpretive skill is necessary when setting the record level. The actual amount of distortion will vary with type and brand of tape. Experimentation is advisable in finding the highest level at which one can safely record without noticeable distortion and treble loss.

It should be mentioned, however, that the true VU meter, whose characteristics (such as needle reaction speed) are precisely specified, is not the only kind of averaging meter. So it is useful to experiment with each new meter to see how its actions may best be interpreted. This is one reason why a VU or other averaging meter is sometimes accompanied by an LED which flashes when signal peaks reach a preset danger level; the LED guards against misinterpretation of the meter and consequent overrecording.

Peak-reading devices are calibrated so that the 3% harmonic distortion level on the tape corresponds to a point near 0 VU on the device. This point may actually be as low as 0 VU, but is usually somewhat higher, such as +3 dB. The signal level which causes distortion to reach 3% will vary somewhat with the type and brand of tape. Once more, experimentation is advisable in order to find at how high a level one can record with a given tape.

In theory, the zero point on either average- or peak-reading meters should indicate the 3% distortion point—by inference in the case of the averaging meter, and directly in the case of the peak-reading meter. In practice, however, meters are not always calibrated to a specific standard. If zero on the meter is at or near the Dolby calibration mark (for which there is a standard), the deck's maker has chosen a zero point that will allow safe recording well above "0," though at the expense of apparently higher noise levels. If the meter's zero is well above the Dolby mark, the deck's maker preferred to maximize apparent S/N by reducing the amount of headroom above "0." The actual performance of both decks could be the same, but you would need to set the recording level to different points on each meter to attain that level of performance.

Meter resolution refers to the ability to make fine distinctions in recording or playback level. Here one is best off with a true meter, i.e., with a needle, rather than all-electronic "meters" made up of LEDs or spots on an LCD or other display. Some such meters

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All brands of a given tape type should take the same bias, but in practice there are differences.

have many fine calibration marks, but their apparent resolution is illusory—the calibration marks do not turn on one by one, but several at a time.

Some Basics

Q. I am planning to buy my first tape deck, but there are several terms I find confusing. What is bias? Is it true that different brands of tape decks are biased for different brands of tapes? Is bias changeable in a repair shop? Also, what is equalization? And what is MOL? I have seen specifications such as MOL equals +7 dB.—Tad Deffler, Fairfield, Conn.

A. Bias is a high-frequency current, usually at least 75 kHz and often over 100 kHz, that is supplied to the record head along with the audio signal. The relative magnitude is roughly 10 to 1. Its purpose is to maximize the amount of signal recorded on the tape, thereby maximizing signal-to-noise ratio, and to minimize distortion. Without bias, the recorded signal would be very weak and very distorted. The amount of bias required varies with tape type. Type I (ferric oxide) requires the lowest bias level; Type II (chromium dioxide and ferricobalt) requires about 50% more bias than Type I, and Type IV (metal particle) requires still more, perhaps twice as much as Type I. Type III (ferrichrome), which requires slightly more bias than Type II, is rarely seen in the U.S. anymore.

Cassette decks today usually provide switchable bias for Types I, II, and IV. Theoretically, all brands of a given type should conform to an industry standard and therefore take the same bias. But in practice, there are some differences from brand to brand of a given type. Therefore, manufacturers align their decks on the basis of specific brands of each tape type, and often they will recommend that these specific brands be used. Some decks provide for user adjustment of bias, some automatically adjust bias, and some provide no adjustment. Any *competent* repair shop can adjust bias to achieve optimum performance with respect to a specific type and brand of tape.

Equalization is a system of frequency alteration in recording and playback, without which a tape deck's record/play response would exhibit severe bass and treble losses and high-frequency noise. In recording, equalization consists largely of treble boost, while playback equalization consists largely of bass boost. The two are not precisely complementary, but are designed so that the combination of recording and playback equalization and the frequency alterations imposed by the tape will add up to flat response.

Playback equalization is standardized, with one curve for Type I tapes (called the 120-μS curve) and another (70-μS) for all other types. In recording, a different equalization is used for each type, and, in some decks, for each tape brand and formulation. Recording EQ is designed so that the signal coming from the recorded tape will, after standard playback EQ, have flat frequency response within stated tolerances.

The term MOL denotes maximum output level—the highest level that can be recorded on the tape, at which point the tape is "saturated" and no higher level can be recorded. The standard recording level, DIN 0 dB, is the signal necessary to produce a recorded signal level of 250 nanoWebers per meter at 33 Hz. A tape with an MOL of +7 would refer to a recorded level 7 dB above 250 nWb/m.

Specification Trade-Offs

Q. I'm about to purchase a cassette deck and have two in mind, priced about the same. My first choice has all the features I'm looking for, but its frequency response is rated at only 30 Hz to 21 kHz, ±3 dB, with metal tape. The second deck, with most of the features I want, doesn't have as high a signal-to-noise ratio, nor does it have dbx NR, but its rated frequency response is 20 Hz to 20 kHz with metal tape. Would the difference between 20 and 30 Hz be noticeable in normal listening (I listen primarily to jazz), or am I splitting hairs? And will the first deck be able to record any music at 20 Hz?—Curtis Jeffries, Jr., New York, N.Y.

A. Assuming that the second deck's frequency response is also specified within ±3 dB limits, it would be only in extremely rare instances—such as, perhaps, with a very large organ that goes down to 16 Hz—that you might find a noticeable difference between a deck with response no more than 3 dB down at 30 Hz and one no more than 3 dB down at 20 Hz. Most music has extremely little content below 30 Hz, and still very little below 50 Hz. In the case of jazz, it's extremely unlikely that you would notice a difference between the two decks on the basis of 30- versus 20-Hz response.

If a deck is only 3 dB down at 30 Hz, it will usually provide some useful response at 20 Hz, unless it incorporates a sharp bass cutoff to avoid problems when taping phono records that are appreciably warped. Quite possibly, response at 20 Hz might be down only about 4 or 5 dB. In that case, a bass control or equalizer used in playback could give you what you want at the *extreme* low end.

Another, and very important, consideration is the response of your loudspeaker. Most speakers start going rapidly downhill below about 40 or 50 Hz. It is a rare speaker, and ordinarily a very expensive one, that maintains substantial response to 30 Hz, much less 20 Hz.

In any event, the performance of the two decks you're considering might be more comparable than you think. You say that the first deck's 30-Hz response is ±3 dB, but give no tolerance for the second one's 20-Hz response. It could well be that it too is down 3 dB at 30 Hz and down still further (6 dB or more) at 20 Hz, and the first deck might have comparable response at 20 Hz. Similarly, the first deck's greater S/N figure might be due only to its having dbx NR; how do the two decks' noise figures compare when using Dolby B NR (which I presume both have)? If you're making tapes only for your own use, the dbx edge might be significant; if you often share tapes with others who do not have dbx, performance with Dolby B NR might be more significant. Also, the degree of significance depends on the noise levels in question: A 5-dB difference looms a bit larger when comparing 60- and 65-dB ratios than when comparing 70- and 75-dB ratios.

All in all, I think you are splitting hairs; the ultimate test consists of listening. Give each of the decks a hearing and decide which one is superior. If they sound the same, select the one that meets your needs in terms of features and price.


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AUDIOCLINIC

JOSEPH GIOVANELLI

Greetings Again

It seems like yesterday, or maybe it was the day before, that I wrote to thank all of you for your interest and wishing you a great 1986. Now I'm writing to express the same sentiments, but for 1987.

My special "thank you" goes out to those who took time from their busy schedules to shed additional light on various topics covered in this column. I have never pretended to have a perfect understanding of each and every detail of the audio field. This fact has shown up now and again, and you readers have been kind rather than destructive in your comments. You are a great bunch!—*J.G.*

What's an Audio Signal?

Q. Is an audio signal simply a special sequence of electrical charges which is dependent on the music? If not, what exactly is it? How does an amplifier increase the amperage of an audio signal?—Shane Voisard, Downers Grove, Ill.

A. Audio signals are a.c. waves whose amplitude and frequency vary with the amplitude and frequency of the sound waves that originally generated them. Watching such a signal on an oscilloscope, you'd see a wave whose height (amplitude) went up as the sound grew louder and whose wave peaks grew closer together, and became sharper, as the pitch of the sound, or the intensity of its high-frequency overtones, went up.

What a basic amplifier does is to increase the voltage and/or power of an audio signal. The changes in voltage which result in audible changes in musical dynamics are maintained. They are simply scaled up in accordance with the amount of amplification provided by the amplifier.

Shortwave Tuners

Q. Why is it that the only bands on American tuners and receivers are AM and FM? A few "boom boxes" have appeared with shortwave bands, but they are quite uncommon. From what I read, all European tuners have at least one shortwave band and one medium-wave band, in addition to AM and FM. There is much of interest to be heard on shortwave. Must the American enthusiast who desires such equipment buy it overseas, or are there ways of obtaining these devices in this country?—David Breneman, Gig Harbor, Wash.

A. The shortwave or high-frequency band covers frequencies from 3 to 30 MHz, or wavelengths from 10 to 100 meters. It is mainly used for international broadcasting and for nonbroadcast applications such as some amateur radio. Shortwave broadcasting and listening are not as popular in this country as they are abroad, so comparatively little shortwave receiving gear is available here.

The medium-wave or medium-frequency band covers wavelengths from 100 up to 1,000 meters, or frequencies from 300 kHz to 3 MHz. The normal AM broadcast band (about 550 to 1,600 kHz) falls within this range, and many foreign radio dials say "MW" (for medium wave) where ours would say "AM." (Our FM band falls in the VHF range, from 30 to 300 MHz.)

The long-wave or low-frequency band covers wavelengths from 1,000 to 10,000 meters, or frequencies from 30 to 300 kHz. It is used for broadcasting in some countries.

Shortwave and long wave are sometimes included in home radios (and even in a few car stereos!), and shortwave was common in U.S. home radios before World War II. However, I suspect they'd be rare in component tuners and receivers, even overseas, because the wide frequency response of these components would create problems with shortwave and long-wave broadcasting and reception (static, for example), making them rather painful to listen to. And my experience with the shortwave portions of tuners and small radios has been that the shortwave bands are even more of an afterthought than the standard AM broadcast band usually is.

My recommendation is that you obtain whatever tuner you like, designed for normal AM/FM. Then obtain a good shortwave receiver. Some of these are portable units with superlative characteristics, including scanning, digital frequency entry, single sideband (SSB), and synchronous detectors. I definitely recommend a unit having a synchronous detector because it will reduce much of the effect of selective fading. Also, pick a shortwave receiver with good image rejection. The modern units accomplish this by using dual-conversion circuits and low-pass filters. Thus, their front-ends can be broad-banded, allowing for simple digital frequency synthesis.

Because of the need for good i.f. selectivity, most shortwave radios do not produce good high-frequency response. But few shortwave broadcasters transmit high-fidelity sound, anyway; spectrum space won't permit that. Even where a station does broadcast a measure of high frequencies, i.f. selectivity often must be set to its narrowest position in order to remove beats produced by adjacent signals.

Microphonic Phono Cable

Q. My turntable's phono cable is microphonic. To illustrate: At full volume there is a rather loud "thump" from the speakers if I tap the cable with a pencil, and bending the cable sharply creates a sharp "pop." Why?—O. O. Callaway, Carlsbad, Cal.

A. Shielded cables, like those used to connect a phonograph to other audio components, have capacitance between their shields and inner conductors. By squeezing or otherwise handling the cable, the capacitance changes in value—at least during the actual handling. These changes in cable capacitance are reproduced as noise if the cable is connected to the input of a high-gain audio circuit.

Note that the amount of this microphonic action depends on the sensitivity of the audio circuits as well as upon the load impedance at the input of the cable. Thus, you will hear less noise if the free end of the cable is connected to a cartridge of low impedance than you will if it's connected to one of high impedance. The amount of noise produced during cable manipulation will be dramatically higher still if no load is connected to the free end of the cable.

In home audio installations, this microphonic problem is rarely encountered because the cables are usually not moved during record playing. Where cables *are* subjected to shock

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

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5A02

Biamplification, with each speaker driver fed from its own amplifier, can reduce intermodulation distortion.

(as in some recording situations), types designed to minimize these microphonic effects are available.

Biamping: Pros and Cons

Q. What is the meaning of the term "biamping"? How is it accomplished? What are its advantages and disadvantages?—Edward Brown, Far Rockaway, N.Y.

A. Biamping is a system in which the woofer in a loudspeaker system is driven by one power amplifier and the tweeter (in that same loudspeaker system) is driven by another amplifier.

In any system with multiple drivers that cover different frequency ranges (such as woofers and tweeters), a crossover must be used to divide the frequency spectrum so that each driver gets only those frequencies it was designed to handle. In most home systems, this crossover is a passive network, built into the speaker cabinet, which divides the power amplifier's output signal. The crossover will have two or more outputs, each delivering a different frequency range to the appropriate drivers. The capacitors, inductors, resistors, and (perhaps) pots that make up such crossovers are usually rather large, because they are built to handle as much power as the amplifier is expected to deliver.

In biamplified systems, an "active" or "electronic" crossover is used instead. The active crossover is connected between the preamp and amplifier. Its active elements (transistors or integrated circuits) make up for signal losses which occur in the network, and may also perform other functions that we needn't get into here.

One advantage claimed for biamped systems is that, because neither amplifier carries the whole audio frequency spectrum, intermodulation effects are reduced. A further advantage is that an active crossover network does not share the passive network's tendency to "ring" at the crossover point. (This ringing is sometimes heard as a peak in frequency response.) Another advantage sometimes offered is that, because the woofer is no longer in series with an inductor, the power amplifier driving it can exercise better damping control over cone motion.

As for disadvantages, cost is certainly one, since a second stereo power amplifier is needed, as is a special crossover network. Another disadvantage is the amount of physical space required by the crossover network and the second power amplifier. Also, systems using receivers or integrated amplifiers may not have the separate preamp-out and amplifier-in jacks which electronic crossovers require.

Perils of Back-Cueing

In addressing the subject of back-cueing (see "Audioclinic," March 1986), Mr. Giovanelli was correct in stating that high tracking force was the major cause of "cue burn." Unfortunately, at the radio station where I work, we are still plagued with cue burn, but it now has two different causes. The first of these results from the radical design of the modern stylus. The elliptical stylus has a very bad habit of digging up chunks and even ribbons of vinyl when a record is back-cued. The quickest and easiest fix for this problem is to use a stylus that has a biradial or conical shape.

The second problem cannot be solved so easily. The quality of vinyl used in today's records is so poor that back-cueing only once *with any shape of stylus tip can damage the lead-in track. Sorry, but the record companies will have to solve this problem.*—John M. Wiley, Chief Engineer, WSIC, Statesville, N.C.

Taking Up a Collection

Q. What do the letters "ASCAP" and "BMI" on record labels mean?—Tim Schindler, Mechanicsville, Md.

A. ASCAP stands for American Society of Composers, Authors, and Publishers; BMI stands for Broadcast Music, Inc.

Both of these organizations were created to help ensure that composers, lyricists, and music publishers are paid for the use of their material. They collect fees from the broadcast industry, from performance halls, and from places (such as skating rinks) where music is played as background or accompaniment to other activities. They then determine, by statistical sampling, which songs have been played most and least often, and apportion the fees they have collected according to how much each creator's or publisher's work has been used. These licensing organizations are listed on record jackets for the convenience of commercial users.

Channel Imbalance

Q. I have a problem with channel balance in my system, which includes a preamplifier and power amplifier. The left channel is louder than the right channel, even when I set the mode selector in the "reverse" position. This occurs on all program sources. I know my speakers are not the cause of the problem because interchanging them does not alter the situation. I can eliminate the problem by setting the balance control to favor the right channel, but this is not a desirable solution. Any ideas? I've already returned the equipment to the manufacturer, who could find nothing wrong.—Arthur L. Stoddard, Anchorage, Alaska

A. There's a logical process you can follow to find the source of any problem which occurs in only one stereo channel. Working back from the speakers or forward from the signal sources, swap cables between channels, one end at a time, and see what makes the problem move to the opposite channel. (Turn the system off whenever you connect or disconnect a cable to protect your components from accidental damage.) If the problem stays in the original channel when you swap cables, then it must be caused by something that follows the point at which you made the swap; if it switches channels, it is caused by something which precedes that point.

For example, if you had not already eliminated the speakers from consideration (as you have), you might disconnect the cable feeding the right speaker and connect it to the left one, and vice versa. If the left speaker is still louder, then the problem would have to lie either in that speaker or the room's acoustics. If the right speaker becomes louder, then the speaker and the room are not at fault—one speaker is simply getting a louder signal than the other.

Assuming the right speaker did get louder, we must trace further back. Swap the cables' other ends, so that the one which was formerly connected to the amplifier's left output terminal is now on the right terminal and the for-

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Where to buy Polk Speakers? For your nearest dealer, see page 152.

If none of your components are causing the stereo imbalance, your room's acoustics may be at fault.

mer right output cable is now on the left terminal. If the problem stays in the same channel, then the speaker cable is at fault; if it swaps channels, then the cable is okay.

Continue this process through the system until you find the trouble's cause. Your preamp's "reverse" switch has the same effect as switching the cables between its left and right output jacks. This absolves your signal sources —phono, tuner, etc. So the preamp, the power amp, and the cables between them are the most likely culprits.

If all the components are okay, then the problem may be in your room's acoustics. Try moving the right speaker to the left speaker's position, and vice versa, while leaving each speaker connected to its original amplifier channel. (If your speaker cables aren't long enough for this, substitute longer ones.) If the left channel still sounds louder, then the room is at fault. Changing the room's acoustics could prove complex and expensive, but adjusting the balance control to favor the right channel (with the speakers returned to their normal locations) will solve the problem easily, and for free. That's what the control is for.

Correcting High-Frequency Hearing Loss

Q. Many people have hearing losses of 10 to 40 dB in the 4-kHz frequency region. This is usually the result of exposure to excessive sound levels. If a narrow-band parametric equalizer were used to boost this frequency region in proportion to the hearing loss, would the affected individual experience music from his audio system as it was recorded?—Britton K. Ruebush, Albuquerque, N.M.

A. It does seem to me that, if one accurately measures a hearing loss as being some given number of dB in some given frequency region, this loss could be corrected by producing the mirror-image curve with a parametric equalizer.

If the measurement is made at just one frequency in a given range, though, one wouldn't know how wide the "notch" is. Thus, if we measure a 4-kHz frequency and find it down by 10 dB, we still wouldn't know what the loss is at 3,900 Hz or 4,100 Hz; we also wouldn't know whether the 4-kHz point is the notch's center frequency or its deepest point. We must measure the whole notch, over a range of frequencies, to know just what equalizer curve would be its mirror image.

It's also possible that the increased sound level at the boosted frequencies might make the sound seem distorted to the listener; any damage the listener's hearing has already suffered from prolonged sound pressure might aggravate that effect. I also wonder if hearing those boosted frequencies for prolonged periods might not further aggravate the listener's hearing impairment.

Challenging Design.

FOR UNDER $500 YOU CAN OWN AN AMPLIFIER JUDGED TO HAVE THE EXACT SOUND CHARACTERISTICS OF AN ESOTERIC $3000 MODEL.

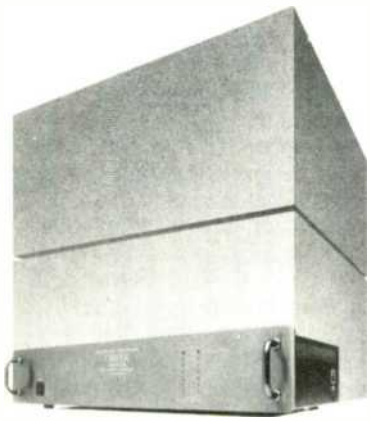
Bob Carver recently shocked the staid audiophile world by winning a challenge that no other amplifier designer could ever consider.

The new M-1.0t was judged, in extensive listening tests by one of America's most respected audiophile publications, to be the sonic equivalent of a PAIR of legendary, esoteric mono amplifiers which retail for $3000 each!

CARVER'S GREAT AMPLIFIER CHALLENGE. Last year, Bob Carver made an audacious offer to the editors of *Stereophile Magazine*, one of America's exacting and critical audio publications. He would make his forthcoming amplifier design sound exactly like ANY high-priced, esoteric, perfectionist amplifier (or amplifiers) the editors could choose. In just 48 hours. In a hotel room near *Stereophile's* offices in New Mexico! As the magazine put it, *"If it were possible, wouldn't it already have been done? Bob's claim was something we just couldn't pass up unchallenged."*

What transpired is now high fidelity history. From the start, the *Stereophile* evaluation team was skeptical *("We wanted Bob to fail. We wanted to hear a difference").* They drove the product of Bob's round-the-clock modifications and their nominees for "best power amplifier" with some of the finest components in the world. Through reference speakers that are nothing short of awesome. Ultimately, after exhaustive listening tests with carefully selected music ranging from chamber to symphonic to high-impact pop that led them to write, *".. each time we'd put the other amplifier in and listen to the same musical passage again, and hear exactly the same thing. On the second day of listening to his final design, we threw in the towel and conceded Bob the bout. According to the rules. Bob had won."*

BRAIN CHALLENGES BRAWN. Below is a photo of the 20-pound, cool-running M-1.0t. Above it are the outlines of the *pair* of legendary mono



amplifiers used in the *Stereophile* challenge. Even individually, they can hardly be lifted and demand stringent ventilation requirements. And yet, according to some of the most discriminating audiophiles in the world, Bob's new design is their sonic equal.

The M-1.0t's secret is its patented Magnetic Field Coil. Instead of increasing cost, size and heat output with huge storage circuits, Magnetic Field Amplification delivers its awesome output from this small but powerful component. The result is a design with the dynamic power to reproduce the leading edge attacks of musical notes which form the keen edge of musical reality.

A DESIGN FOR THE CHALLENGES OF MODERN MUSIC REPRODUCTION. The M-1.0t's astonishingly high voltage/high current output and exclusive operation features make it perfect for the demands of compact digital discs, video hi-fi and other wide dynamic range playback media. The M-1.0t.

- Has a continuous FTC sine-wave output conservatively rated at 200 watts per channel. *
- Produces 350-500 watts per channel of RMS power and 800-1100 watts momentary peak power (depending on impedance).
- Delivers 1000 watts continuous sine wave output at 8 ohms in bridging mode without switching or modification.
- Is capable of handling unintended 1-ohm speaker loads without shutting down.
- Includes elaborate safeguards including DC Offset and Short Circuit Power Interrupt protection.

SHARE THE RESULTS OF VICTORY. We invite you to compare the new M-1.0t against any and all competition. Including the very expensive amplifiers that have been deemed the M-1.0t's sonic equivalent. You'll discover that the real winner of Bob's remarkable challenge is you. Because world class, superlative electronics are now available at reasonable prices simply by visiting your nearest Carver dealer.

***SPECIFICATIONS: Power, 200 watts/channel into 8 ohms 20Hz to 20kHz, both channels driven with no more than 0.15% THD. Long Term Sustained RMS power,** 500 watts into 4 ohms, 350 watts into 8 ohms. **Bridged Mono power,** 1000 watts into 8 ohms. **Noise,** 110dB IHF A-weighted. **Weight,** 20 lbs.

CARVER P.O. Box 1237 Lynnwood WA 98046

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IVAN BERGER

SEPARATION ANXIETIES

Illustration: Teresa Anderko

Component Concepts

Buying separate tuners, preamps, tape decks and so on gives home stereo buyers a chance to get exactly the mix of features and performance that they desire for each product. In the car, this same approach has failed, for several reasons: There's no place to put all the separate control panels, multiple panels can create a safety hazard, and the choice of available components was never large enough to be worthwhile.

To give car stereo buyers diversity without crowding and safety problems requires a different approach. With today's electronics, you could operate a bunch of control-less function modules from a single control panel, and pick the panel and modules that best fit your needs.

The panel could come in two varieties, one with simple controls and the other with every feature in the book. Some of those features (a mute button, for example) could be built into the panel, while others would only be shown and operated from the panel if the appropriate function module had them. For example, if your tuner module was FM-only, the control panel wouldn't show an AM/FM selector. You'd also be able to put a second tuning and control head in the back seat. And the station display could be duplicated on a mini-dial atop the speedometer pod, where the driver could see it without having to look away from the road.

The same transport controls could operate cassette, CD and even DAT transports, to conserve panel space The CD and DAT transports might even share some signal-processing electronics.

The function modules would vary more in performance than in features, though. Users who only occasionally listen to radio, or who do all their driving around town, could buy a limited-performance tuner module; from there, the choices would escalate to a top model with dual-bandwidth FM and AM stereo, diversity reception and the best possible specs. The buyer who wanted in-dash cassette, CD and DAT could still wind up with a space problem—but trunk-mounted changers for each medium would also be available.

This modular system would cost more to install, but should also cost less to insure: The extra installation time would be matched by the extra time it would take a thief to uninstall it. Nor would a thief know, simply by looking, whether you had the high- or low-performance modules.

You could upgrade, module by module, as you now do with home components. If you did, you'd even have a use for the entry-level components you began with: You could save them until trade-in time, then reinstall them to enhance the old car's value.

For this to work, there'd have to be a wide variety of mutually compatible components available. And for that to happen, many different manufacturers would have to agree on interfacing standards. Fat chance.

The Silent Alps

Rental cars in the U.S. tend to come with AM-only radios (at least in the price classes I usually use). So my wife and I were pleased to learn, when we rented a small Peugeot 309 in Europe, that it came with an AM/FM/cassette stereo system.

Only we never really listened to it. While classical music programming is a bit easier to find in the European than in the U.S. boondocks, we found radio listening frustrating. For one thing, radio stations in France and Switzerland program the way U.S. stations did when I was a kid—each station I heard at length tried to balance its programming among several listener interests rather than hewing rigidly to a single-interest format. For local listeners who know which to tune in and when, that's good; for strangers driving through, it's not so good. When we did find a program we liked, we'd usually drive through a mountain pass about halfway into the program, and find an Alp between us and the station. That was no surprise—even the hills of Vermont can screw up reception, and they're only hills.

We'd brought no cassettes with us. So what did we do? We shut the radio off and concentrated on the scenery and our driving. In the Alps, both merit full attention.

Have Guide, Will Travel

For classical music fans who travel, Chicago's WFMT offers a free "Classical Radio Guide," which lists about 1,000 stations that play the classics, in 30 states plus the District of Columbia, Puerto Rico and Guam A station need only play classical music two hours per week to qualify for inclusion, so listings are no guarantee of what you'll hear when you tune in. Still, some of the listed stations do play classical music all or most of the time. You can get the guide by sending a postcard to Dean Grier, WFMT, 303 East Wacker Dr., Chicago, Ill. 60601.

Meanwhile, what of the missing 20 states? Is that much of the country devoid of classical programming? Or are there simply stations out there that WFMT doesn't know about?

stereophile

"Can two preamplifiers costing $500 offer $2000 worth of sound?"

Anthony H. Cordesman
Stereophile, Vol. 9 No. 7

Adcom GFP-555 Preamplifier

Total harmonic and IM distortion: 0.005%. S/N ratio: better than 85dB (phono), 100dB (line). Frequency response: 1Hz-100kHz, ±0.1dB. Input sensitivity: 40mV (line), 0.4mV MM phono, 0.13mV MC phono. Maximum output: 10V. Input impedance: 47k (MM phono), 100 ohms (MC phono). Output impedance 470 ohms. Phono overload at 1kHz on MM phono: 140mV. Phono input capacitance: 100pF, 175pF, or 275pF. Size: 17"W x 3¼"H x 12¾"D. Weight: 14lbs. Price: $499.99. Rack mount adaptors: Model RM-3, price $20. Manufacturer: Adcom, 11 Elkins Road, East Brunswick, NJ 08816. Tel: (201) 390-1130.

stereophile

"Adcom has introduced some really good, reasonably priced power amplifiers; they've proved it is possible to produce true high-end sound at mid-fi prices."

The complete review:

It probably won't come as a shock to most readers of *Stereophile* to hear that reviewers rarely get much pleasure out of reviewing inexpensive stereo gear. Reviewing is a wretchedly paid hobby at best.[1] The fun lies in discovering great sound, not in trying to survey the sonic equivalent of junk food.

There is also a dull monotony to the sound of most gear sold at low prices. While sonic differences do exist, virtually all such gear has the following sonic characteristics:

- A loss of deep bass and mid-bass dynamics, with either bass overhang or too little bass energy.
- A loss of warmth in the upper bass and lower midbass.
- A dull, undynamic midrange, lacking in inner detail.
- An apparent emphasis on the upper midrange that makes the overall sound of the music lean. This is normally coupled to a loss of detail, which deprives music of its sweetness and air.
- Upper octaves which seem to have as much amusical as musical content. Such equipment often emphasizes the treble when an instrument with real high frequency content is playing in a way that is not musically natural.
- Difficulty in reproducing the softest passages. The fine detail in music is lost, along with much of the reflected sound and out-of-phase information that helps portray the ambience of music and the sound of the performance hall.
- Trouble in handling loud passages. The listener is never really comfortable playing loud musical passages at anything approaching live performance levels. Trying to do so makes the music cease to be emotionally involving, sometimes even irritating.
- An overall feeling of dullness, constriction, and compression. Music sounds less dynamic, and sudden dynamic changes in the music lose much of their impact.
- The soundstage is restricted, to some degree, in every dimension. There is a tendency to either put everything in the center, or to produce two-point imaging, the instruments all grouping around one speaker or the other.

1 And never more wretchedly than at *Stereophile*.

This family of unpleasant sound characteristics makes reviewing wretched in another way. It's no fun to trash most of the products priced at levels people can actually afford. Further, it is bad form, as far as editors go, to greet the sonic differences between low- and moderate-priced receivers, integrated amplifiers, preamplifiers, and power amplifiers with a long literary equivalent of "Who cares?" Editors want copy that is more interesting than the product under review.

In all honesty, though, it *is* damn difficult to care about the "nuances" of most low- and moderate-priced gear, particularly when it comes to preamps. For years, the main issue in reviewing transistor preamplifiers has not been a question of which sounds best, but which sounds least unpleasant. A very few firms (e.g., NAD) have produced decent-sounding cheap preamps, and a few firms (e.g., PS Audio) have produced good and moderately priced preamps, but very good to excellent sound has either been confined to the cheaper tube preamplifiers, or has simply been unavailable in this price range.

"The GFP-555 is a very nicely built unit, inside and out. It is unclear from close examination why it should cost only $500, with so many competing preamplifiers costing over $1000."

The preamp, and its equivalent gain stage in integrated amplifiers and receivers, has been the Achilles' heel of stereo electronics. The more gain you need from the damn things, the more your ears harden![2] This has even been true of many expensive transistor preamps. By and large, they have either had some hardness in the upper midrange, or have achieved smooth upper midrange at the cost of detail. Most have lacked midrange warmth and punch. Only a few of the highest-priced transistor preamps have ever been fully satisfactory.

2 This is a phenomenon medically known as *preamp-sclerosis*. —J.A

These problems have also sharply affected the sound available from moving-coil cartridges. Making a preamp with a really good built-in mc stage has been the bane of most designers' existences, and anyone who has had to review step-up devices and reference-quality preamplifiers has also become all too aware that many transistor preamps—even in the $1500 to $2000 class—do serious damage to the sound of moving-coil cartridges, producing a major loss of sweetness and detail. The general rule in preamps has been: "The higher the gain, the greater the pain!" Preamps have not been kind to the long-distance moving-coil listener.

This is why the appearance of the Adcom GFP-555 and PS Audio 4.5 is something of a special event. All of a sudden there are two moderately priced preamplifiers with excellent overall sound, and really good mc gain stages. They are not only actually fun to review, they solve some problems that few preamps at any price have been able to successfully deal with.

With each company you can also buy a moderately priced companion power amp of significant quality. Both Adcom and PS Audio have been making major progress in improving both their sound quality and imaging during the last two years. Adcom has introduced some really good, reasonably priced power amplifiers; they've proved it is possible to produce true high-end sound at mid-fi prices. And PS Audio's power amplifiers have gradually broken into the top echelons of high-end sound without breaking anyone's bank account.

The Adcom GFP-555 Preamplifier

There is no point in ranking the Adcom relative to the PS Audio, since both have excellent sound but represent different design concepts, with different overall sound characters.

The GFP-555 is a very nicely built unit, inside and out. It is unclear from close examination why it should cost only $500, with so many competing preamplifiers costing over $1000. The case may not be quite as fancy as some of the competition, and the RCA jacks may not be Tiffanys, but

"The overall ergonomics are excellent."

the overall quality of parts and construction is excellent. The power supply is large for a preamp, heavily regulated, and uses a Mu-shielded power transformer and high-capacity power capacitors.

The circuit boards are glass epoxy, with copper plating on both sides to reduce hum and RF interference. All input and output jacks are wired directly to the chassis, as are the selector switches. Long traces and wires are avoided, to minimize noise, hum, and diode effects. The capacitors and resistors are not always of the highest grade, but electrolytics are bypassed with high-quality polypropylenes, polystyrenes, and silver micas.

The solid-state devices are of very high quality; Adcom has spent several years testing various devices on high-end systems to select the ones that actually sound best. What's surprising is that Adcom has made successful use of a line amplifier in the phono stage. These normally present sonic problems, but Adcom seems to have solved them by careful selection of an instrument-quality device.

The actual circuit topology is more a matter of refinement than innovation, and the features of the GFP-555 follow the same pattern. This is not a purist's preamp: it has filters and tone controls, and even loudness compensation. The filters are switchable 6dB/octave, designed to remove sonic garbage from outside the audio band, not alter the sound of music. The high filter is down only 2.5dB at 20kHz, the low filter down 5dB at 20Hz.

"...this is one of the most satisfying preamps around in terms of overall tonal balance; it outperforms several 'competitors' from the $2500 bracket."

The tone controls are—well, tone controls (nice knobs, though!). You get an adjustment range of ±9.5dB at 40Hz and 15kHz, and much good may it do you. As for the boom control (whoops, loudness compensation), it produces a 6dB rise at 50Hz. Just perfect for the poor schmuck who can only afford an Infinity IRS. Let's just say that the tone controls and loudness compensation can easily be turned off, the filters [can] be useful, and the presence of such controls doesn't prevent the GFP-555 from being a great preamp for the money.

More useful is the large number of inputs, and two totally independent selector switches for the main channel and tape recording. There is a headphone jack with its own amplifier, and two sets of main outputs—one for amps with direct coupling, one for amps that require input capacitors. There are two independent tape loops, plus another for signal processors—which may give the GFP-555 a special advantage in high-end video installations with four-channel decoders.

The styling is basic black, with excellent labeling—except for the lack of calibration points on the balance and tone controls, and output jacks named "lab" (capacitor-free) and "norm" (capacitor). The overall ergonomics are excellent—so obvious that even the dimmest husband can understand how to operate the unit after a few moments of patient guidance from his wife. There are two switched outlets in back, and a handy switch for shifting between high- and low-gain phono inputs.

"Don't worry about loud passages. You will be comfortable playing loud musical passages at volumes approaching live music."

I find questionable the provision of a rear panel switch to adjust phono capacitance, for two reasons. First, modern magnetic cartridges are no longer particularly sensitive to capacitance; it would have been far better to provide variable loading for moving coils. The 100-ohm load Adcom has chosen is the official Japanese standard, but is also one of the worst-sounding loads for most high-quality moving-coils. A choice of 47,000 ohms, 50 ohms, and 20 ohms would be far better.

Second, I can't figure out why Adcom chose the loading capacitances it did; presumably they have some specific cartridges and tonearm cables in mind. Can it really be that everyone at Adcom listens to ancient Shure cartridges instead of their own very good, high-output moving-coils? Talk your way out of this one in your comments, manufacturer!

By and large, however, the Adcom offers features that many audiophiles want, regardless of how snobbish reviewers may feel about them. There are many installations where the turntable, tape recorder, or other signal source does produce subsonics, and where RFI makes a high-frequency filter useful.

Some people with hearing problems (or bad CDs and CD players) can benefit from tone controls, and they slope at reasonably convenient points for providing record-noise and tape-hiss compensation—without affecting too much of the music. Loudness compensation is harder to defend. It may be useful for Randy Newman audiophiles, that strange group that listens to tiny little monitor speakers with tiny little bass, entering their tiny little minds through tiny little ears. More seriously, I suppose such a control could help with cheap speakers, though my experience tells me such compensation usually results in excessive and poorly defined midbass.

The Sound

Any nitpicks regarding features are of relatively minor importance compared to the sound quality of the GFP-555; it is sound quality that keeps the Adcom from being just another preamp. Let's take the same list of sound characteristics I criticized earlier, and discuss how the Adcom differs:

Deep bass and midbass dynamics are very good. There is no bass overhang, and bass energy is realistic. Only a few of the best competing units provide significantly deeper and more extended bass, or better dynamics and control.

There is no loss of warmth in the upper bass and lower midbass; the Adcom is full-bodied and realistic. Fanciers of the better tube preamps will be only mildly disappointed.

The midrange has realistic dynamics and only a slight loss of inner detail.

There is no emphasis in the upper midrange. The overall preservation of timbre is very good, and the slight loss of detail doesn't deprive music of its sweetness and air. After a few days of burn-in, this is one of the most satisfying preamps around in terms of overall tonal balance; it outperforms several "competitors" from the $2500 bracket.

The upper octaves are there, but properly unassuming. If the source material is really good, the highs get through in a musically natural form. Instruments with real high-frequency content don't suddenly gain detail and harmonics not present in live performance.

"The music is real and emotionally involving—dynamic peaks sound like dynamic peaks."

The Adcom is surpassed only by a few high-priced top-quality preamps at reproducing the softest passages. Some of the fine detail in music is lost, but very little. The GFP-555 does an excellent job of passing through most of the reflected sound and out-of-phase information.

Don't worry about loud passages. You will be comfortable playing loud musical passages at volumes approaching live music. The best tube and transistor preamps are clearly superior in this area, but the Adcom GFP-555 is very good. The music is real and emotionally involving—dynamic peaks sound like dynamic peaks.

"...it is one of those preamps that really stand the test of time. You can go back to it after a few weeks and still feel it to be basically right; It reveals most associated equipment as more colorful than itself."

There is very little constriction or compression; music sounds open and dynamic. You not only can listen to loud passages and enjoy them, you get most of the impact from sudden changes in musical dynamics.

The soundstage has good depth, width, and height. It is only very good, not excellent, but the centerfill is stable and the instruments spread out in a natural arc with very good depth. Only a small number of units do better.

The Adcom preserves these virtues whether you use the moving-coil gain, the magnetic-cartridge gain, or the line-gain stages. There are many step-up devices in high-end systems that cost twice as much as the entire GFP-555 and sound only half as good. It's a pity that proper loading has to be through external shunt resistors, but if you keep those obscene post cards coming, perhaps the folks at Adcom can be persuaded to change.

This does not mean that the Adcom is a totally neutral device or rivals the Motif, Audio Research, and CAT preamps I've reviewed in this issue, nor the Krell I've mentioned in the past. There is a consistent loss of information that the very best preamps let through. The loss of transparency, however, is minor; the GFP-555 does everything at least well, and most things very well. As a result, it is one of those preamps that really stands the test of time. You can go back to it after a few weeks and still feel it to be basically right; it reveals most associated equipment as more colored than itself. Were it not for the near-simultaneous appearance of the PS Audio 4.5, I would say there is nothing competitive under $1000.

The Adcom GFP-555 and PS Audio 4.5: The Issue of Value for Money

It should be obvious from the ..... reviews that both the Adcom GFP-555 and PS Audio 4.5 offer outstanding value for money in two very different forms. Which is best for you? Well, if the above descriptions of features and sound characteristics don't provide a guide, nothing more I can say will help. You many actually have to break down and listen to both units before you choose which to buy!

If you do, I think you will agree that both of these preamplifiers are Class B by any standard, and push hard at the performance levels set by their much more expensive competition. While I suspect that top firms like Audio Research, Conrad-Johnson, and Krell can sleep soundly in their beds tonight, very good firms like Klyne, Mark Levinson, and Perreaux have reason to be a bit restless. In fact, I offer the following challenge: A/B either the Adcom or PS Audio against any competing transistor preamplifier at any price. You may well find that you just saved $1500 to use on new speakers, turntables, CD players, or wine.

"...A/B either the Adcom or the PS Audio against any competing transistor preamplifier at any price. You may well find that you just saved $1500 to use on new speakers, turntables, CD players, or wine."

I would also suggest that some of our Asian friends rush out and buy both preamplifiers for their design engineers. There is no reason that the world's main source of stereo equipment cannot copy something good for a change, and break away from the monotonous search for more brand-specific, trick-circuit features, extra switches, and controls. The world deserves a better quality of clones.

MANUFACTURER'S COMMENTS

Editor:

Thank you for AHC's thoughtful and positive comments on the new Adcom GFP-555 preamplifier. To avoid a deluge of obscene cards and letters, we would like to clarify the cartridge loading possibilities in the GFP-555.

Impedance: A 47k load is not only available, but standard on the "high" MC/MM input. While high output moving-coils will provide greater dynamics through this input, many low-output MC cartridges can be operated, although with somewhat reduced voltage driving the power amp. When more gain is required, the "low" MC position adds an additional gain stage for increased output voltage, and then has an input impedance of 100 ohms. This isn't really an "official" standard, but is the load most frequently recommended by makers (Japanese and others) of these devices. If unsuitable for any *Stereophile* reader's cartridge, most Adcom dealers and the factory's service department will provide a lower value impedance on request. We don't encourage your readers to negate the mandatory electrical safety warnings by going inside the unit themselves, and don't find the idea of infinite variability, achieved by internal friction posts and a bag of loose resistors, very appealing.

Capacitance: Our choice of added capacitance values, which affects the linearity of MM, IM and variable-reluctance type cartridges, evolved from the many hours of listening and testing of hundreds of new cartridges on the market, not just "ancient Shure cartridges." As *Stereophile* is aware, Adcom has one of the most sophisticated cartridge development and testing laboratories to be found anywhere, and our tests indicated that his feature is still desirable—at least until all your readers own an Adcom Crosscoil, a Koetsu or a Dynavector.

"Tone controls, filters, loudness contour...who needs them?" Our feeling is that many *Stereophile* readers can use some of these features some of the time. In an imperfect world where so little recorded material is really flawless, we'd rather have the options than not. The adjustment range is subtle enough to permit use of the controls, on command, without disfiguring the musical forms and shapes. We know that critics and reviewers learn at an early age to disdain these perks, but we hoped you'd try ours out, notice that they're not only different but better, and love us for it. Think about this the next time you're playing a CD with a jagged and irritating top end that's laser-drilling your eardrums, and can't find a way to tame it.

ADCOM
—East Brunswick, NJ

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EDWARD TATNALL CANBY

FOREIGN ACCENTS

Illustration: Karen Barbour

Thanks to Denon, the major corporate arm of Nippon Columbia in Japan, I have just emerged from a Mahler marathon—more of Gustav Mahler's music than I have heard in all the rest of a longish musical life, and this in no more than a few days. What an experience! Denon recently completed digital recordings of all nine-plus Mahler symphonies (the Tenth was unfinished), and I attended the final climactic recording session and concert of Symphony No. 8, the "Symphony of a Thousand," which brought together, if not 1,000, no fewer than 700 performers in a stunning new German concert hall. I'm still in a daze and Mahler oozes out of my ears.

There was first the music itself, vast stretches of it, almost hypnotic, demanding hours of attention from me before I even started for the big event in Germany. The stuff grabs you. It grows on you. After an unbroken evening of it you are shaken, but hooked. As a sort of preparatory training course, Denon sent me the first four symphonies, filling six very long CD sides and almost that many evenings of listening. I played every note and particularly fell for the odd-numbered symphonies, Nos. 1 and 3 (and, later, No. 5), which I played *twice* through. Some indoctrination! It was a memorable experience; of my own free will I would never have gotten around to so much Mahler.

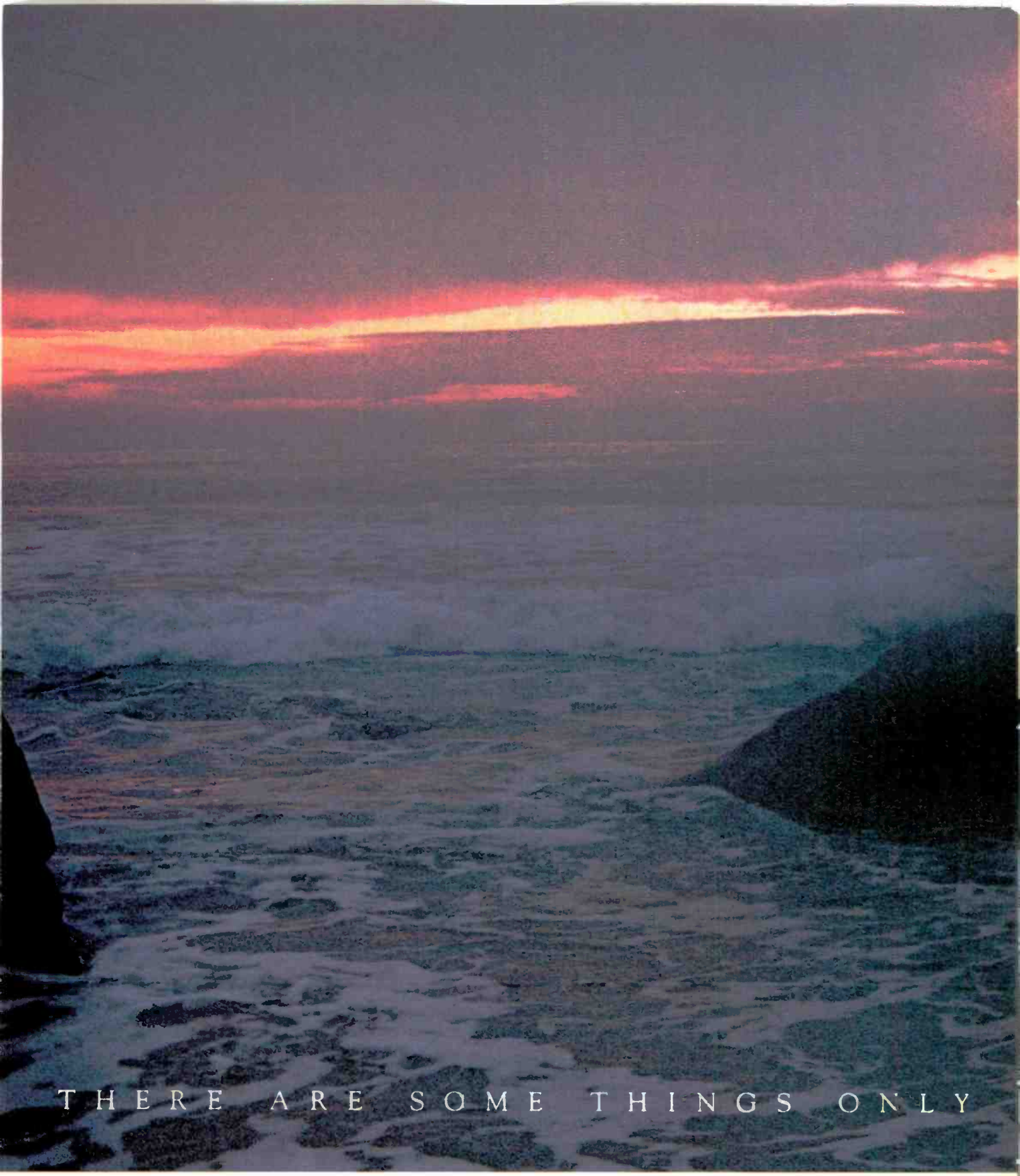
The Denon performers were the Frankfurt Radio Symphony Orchestra and numerous soloists, massed choruses, remote brass bands, all under the direction of Eliahu Inbal, the orchestra's regular conductor. They had performed a complete Mahler cycle only a few years back and have the stuff down cold, no matter how enormous the length. As a musician, I'd say these could be the definitive performances for our time, and Denon's the definitive recordings.

Curiously, these huge symphonies make splendid recording material—if you can do it right. The Mahler sonics are built upon the most astonishing orchestrations ever put down in a billion or so mere notes on paper. The climaxes are overpowering but most of the music is not loud, though it is extremely transparent; the enormous Mahler orchestra has been called "an orchestra of solos," with a sound that for all its vastness is as varied and as delicate as so much chamber music. Eliahu Inbal calls it *fragile*, so easily can it be thrown out of shape and balance in the playing. The stuff must be prepared with the most exact attention to detail, in spite of its huge dimensions.

And then there was the Denon PCM digital recording. Listening at home, I immediately found the CDs startlingly good (and this is not an ad). They have just the sort of transparent sound that the music needs, in a clear, easy ambience, never blurred, and with a faultless dynamic range from a whisper to a roar. This, of course, had to have come from a happy combination—clean electronics out of superb mikes, an obviously "right" hall, and a mike technique to do it justice. My training course at home, as you may gather, was plenty effective.

Then, in a few short hours, I was whisked straight to Frankfurt and the recording site. Thanks to a roaring tail wind, the flight arrived an hour and a half early. In no time—that is, at 6:30—I found myself in the Denon control room at the Alte Oper (Old Opera House), where the recordings were being made. And at 8 that evening we were in our seats at one of the most extraordinary concerts halls I ever hope to visit. New and absolutely enormous, with 1,060,000 cubic feet of air space, the Alte Oper was recently built inside the shell of an 1880s opera house bombed out in WWII (long dubbed "the most beautiful ruins in Germany"). In that hall I heard sonic effects I still cannot quite believe—more on this later. Ideal for Mahler, just as big as the composer's music and yet equally gracious and full of subtlety. At once I could recognize the ambience I had heard back home, for it seems to carry over into Denon's primarily "one-point" stereo. Strangely, as the music began, I sensed with some awe that the recordings did not sound like the hall—*the hall sounded like the recordings*, which is an altogether different matter. I pondered this for a long time and still find it fascinating.

After the simultaneous public concert and recording (some two hours of Mahler in absolute audience silence; I heard just one damaging cough the entire time), we were again whisked to a late party at the conductor's suburban home. Phew—how could I stay on my feet? But I did. Too much of interest to bother with sleep. We loaded into three taxis, the group of correspondents and Denon people (only two of



A siren's song whispers untold promises. A centaur's horn cries hauntingly. For listeners with discerning ears, those rare and magical sounds can be a reality. A reality evoked by a speaker possessing a higher fidelity. Altec Lansing.®

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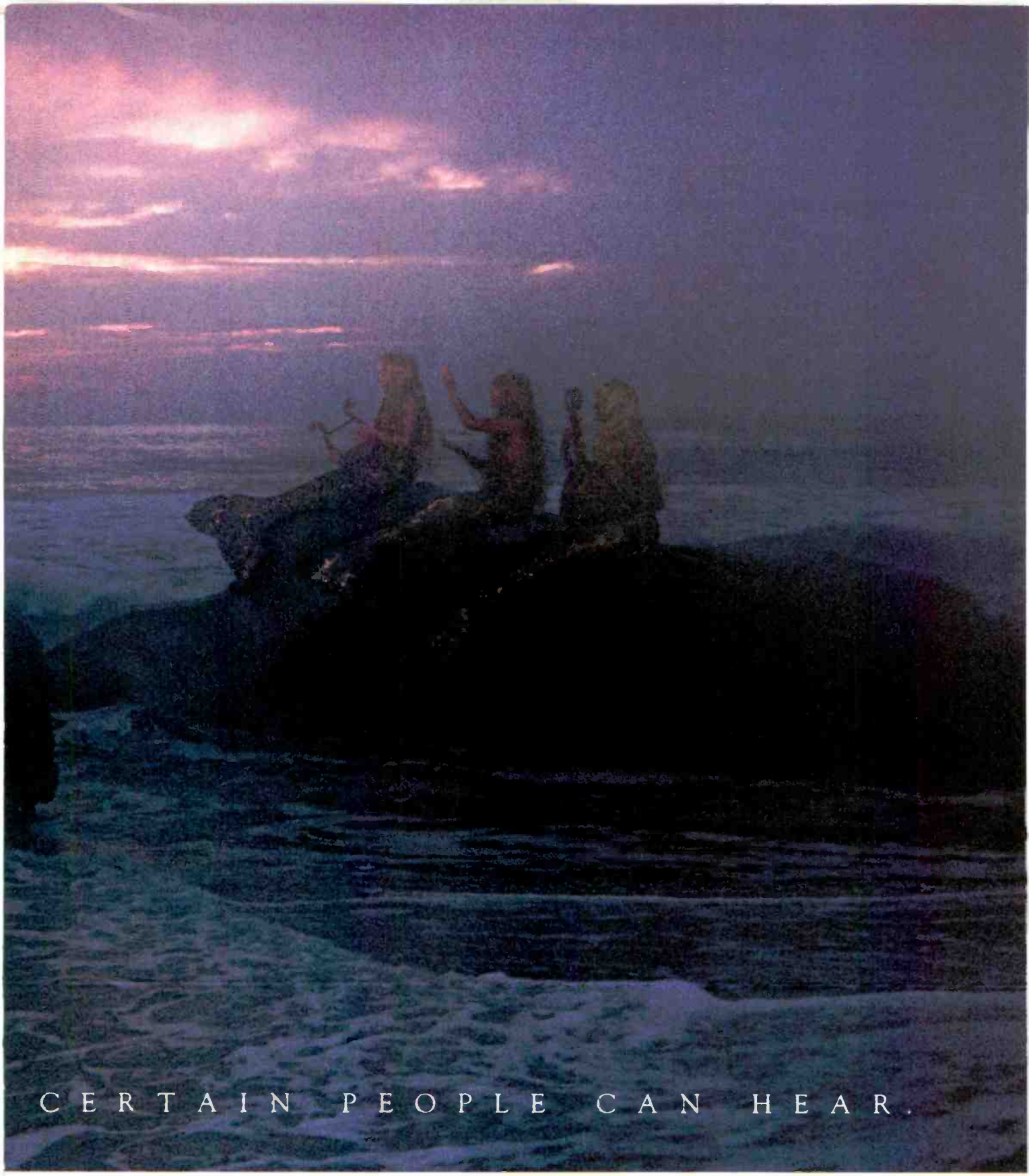

designed for optimum musicality. The result? Speakers so pure, so uncompromising, they capture the very soul of sound.

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Altec Lansing is sold only by leading high fidelity retailers. For information and the name of your nearest Altec Lansing dealer, call 1-800-ALTEC 88. (In PA, 717-296-HIFI). In Canada call 416-496-0587 or write 265 Hood Road, Markham, Ontario, Canada L3R 4N3.

ALTEC LANSING

Denon's recordings of the Mahler symphonies have just the transparency the music needs, as well as a faultless dynamic range from a whisper to a roar.

us from the U.S.), and set off on the Autobahn, only to end up lost in a welter of small suburban villages with twisty, narrow streets. Our half hour of wandering was not in vain: We found the place and had a splendid little party, just us, champagne followed by a casual supper with two tables, one for those who could cope with English and the other for those who couldn't. Eliahu Inbal (who could) moved easily back and forth between the two; his wife, father-in-law, and daughter fetched the goodies from the kitchen. No fancy catering; just them, and the nicer for it.

This is a remarkable musician, this Inbal, authoritative and in his middle years still a rising star but, even so, modest and not in the least egocentric like so many celebrities. When we talked about Bruno Walter's definitive earlier recordings of Mahler (Walter was an associate of Mahler's), I got the feeling that Inbal was really listening. Rare! We will be hearing him and his Frankfurt orchestra in the U.S. about the time this is published.

By 2:30 a.m., when we got back to Frankfurt, I was a walking zombie. All this in one super-long day! But there was, mercifully, nothing on the agenda until the following noon in the control room, and so I recovered, behind the impenetrable curtains of my hotel room. This was no sightseeing trip.

That noon control-room conference was vital. At the concert the night before, we could see all sorts of microphones, dangling and on stands, but could not figure out how they were being used to capture the sound of such a mass of performers. The noon briefing session gave us an excellent account of Denon's procedures and the equipment in use, mainly from the attending Japanese engineer, Yukio Takahashi, and his co-engineer out of Denmark, Peter Willemoes, whose name will be familiar to many *Audio* readers. Indeed, this get-together inside the control room, with the equipment right there on hand, was much like those that AES and other U.S. groups put on in various locations—a studio in L.A., a control room in New York, and so on—part lecture and part demo, with lots of free discussion, give and take.

There was, however, one difference. This event went its casual way in no fewer than six languages, shifting easily from one to another, as is the European practice. A matter of politeness. A French correspondent asks a question, perhaps in English; the answer, courteously, is in French and that language continues for a while. Until, let's say, an Italian (we had one present) asks something in German, respectful of our hosts on this occasion; the answer will be in Italian. For us Americans, who never learn anybody else's language, this can be confusing. Nobody speaks his own tongue. It's all an important element of social grace and good manners, quite aside from communication, which is taken for granted.

Digital Discrimination.

BECAUSE ALL CD'S ARE NOT CREATED EQUAL, THE NEW CARVER DTL-200 COMPACT DISC PLAYER IS INTRIGUINGLY DIFFERENT.

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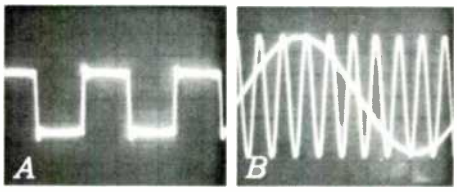
The DTL-200's Time Domain Correction circuit constantly performs a complex, 25-bit digital calculation on passing data. This high-speed error correction algorithm, in conjunction with a 121-pole digital filter, terminates distortion-causing high harmonics as they occur in the bit stream. The result is frequency response within 1/1000 of a dB of the original, with significant reduction of distortion to less than 0.007%.

PLUS THE DIGITAL TIME LENS. On top of this unerring ability to produce natural, real-sounding music from the CDs' digital bits, the Carver DTL-200 has the remarkable Digital Time Lens circuit to insure your listening enjoyment.

When Bob Carver obtained his first compact disc player, he was surprised at the sound derived from most of the compact discs he purchased. The three-dimensional musical perspective which his analog system provided in lush abundance on phono discs evaporated into a flat, brittle wasteland. After extensive testing, Bob uncovered two fundamental flaws in almost all compact discs: 1) An unpleasant, harsh spectral energy balance. The overall octave-to-octave energy balance was shifted on the CD towards more midrange above 400 Hz. 2) The amount of L-R signal (which carries the spacial detail of the music) on the CD was inexplicably, but substantially reduced when compared with the amount of L-R signal found on the corresponding analog disc. The difference is obvious in these two oscilloscope photos.



A. Lissajous pattern showing spatial detail (L-R) (L+R) ratio from an LP record.
B. The same instant of music but taken from the CD version. Note the decreased (L-R) content, as shown by the narrowed trace.

Carver's circuitry corrects the ratio of L-R to L+R by performing one extra, but important mathematical operation on the signal stream that all other CD players fail to perform. This final operation makes all the difference.

The result is a natural sound with more of the three-dimensional information that places us in the same space with oerformers. You won't need the Digital Time Lens on all CDs. But it is there when you need it.

In the beginning, Carver hoped, indeed he expected, that once recording artists and engineers became more experienced with CD technology fewer and fewer CDs would require the Digital Time Lens. But both laboratory and listening tests reveal that the majority of even the most recently released CDs benefit significantly from the Digital Time Lens.

PACKED WITH USEFUL FEATURES. The Carver DTL-200 makes enjoying Compact Discs a simple exercise in button pushing from your favorite listening chair. You can program any combination of up to twelve tracks from a single CD, repeat a specific track or a whole Compact Disc for uninterrupted enjoyment.

Along with the ability to skip forward or backwards song-by-song, a touch of a key allows you to audibly review a disc backwards or forwards at many times normal speed. An A-B Specific Phrase Repeat lets you carefully analyze one section of a performance or simply provide a point of reference in a long, un-indexed symphonic movement.

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I counted 22 separate pickups in the hall; *this* was one-point? It seemed like a setup used in the heyday of multi-miking.

So I must admit, with sorrow, that there were some minor details I missed in spite of close attention.

There is so much to relate concerning this quickie trip that I am going to have to write piecemeal; the Alte Oper concert hall is so unusual that I'll save it for another account. But I must get to the recording technique, which is of special interest in this magazine, needless to say.

What we had seen the previous night, as we filed into our reserved seats in row 8 of the Alte Oper, was a huge stage already filled with acres of musicians, and on a balcony above and around them, spread out in a vast C shape, chorus after chorus, hundreds of singers, each group in a different costume. They were to sing in "stereo," antiphonally, group by group. There is no proscenium arch and no curtain in this hall; the stage is low and sticks out nearly to the middle of the hall, filling almost half the floor, an extension of a concert tradition that goes back centuries in Europe.

Hanging on fat pairs of cables, looping down and up, were no fewer than eight large mike systems, facing the various choirs in that square-horseshoe balcony—coincident stereo pairs, by the distant look of them? Facing in three directions, 180°! Then I discovered more mikes, seven out front for seven solo singers, one more on a tall stand for an eighth soloist far away in the balcony. And still more—high, middle, low—for various orchestral instruments. Later, I found there was miking for a brass choir far up in the rear balcony. Some 22 separate pickups. So this was "one-point"? I was baffled.

It took me a while to notice still another pair of mikes, this one high in front of the orchestra, clearly two mikes in stereo, not quite coincident, a couple of feet apart, pointing horizontally like two thumbs stuck out in opposite directions. Could this be for overall ambience? The setup was beginning to look very much like those used back in the glorious '70s, the heyday of multi-mike classical recording.

Not at all. What we learned in the control room was that those two high front mikes, near-coincident, were *the* main stereo mikes for the sound of 700 performers. It *was* essentially one-point stereo, with a touch of phase difference added to improve the digital stereo ambience. Indeed, for the "smaller" Mahler symphonies (minus huge chorus et al.), these were virtually the exclusive source for the sound. In No. 4, with soprano solo, this was the only microphoning. Pure one-point. In No. 5, an absolutely stunning recording (I heard this one on my return home), all but a very small part of the symphony was done the same way, including the unusually powerful brass passages. Each of those two omnis, you should know, was a celebrated Brüel & Kjaer 4006, developed out of

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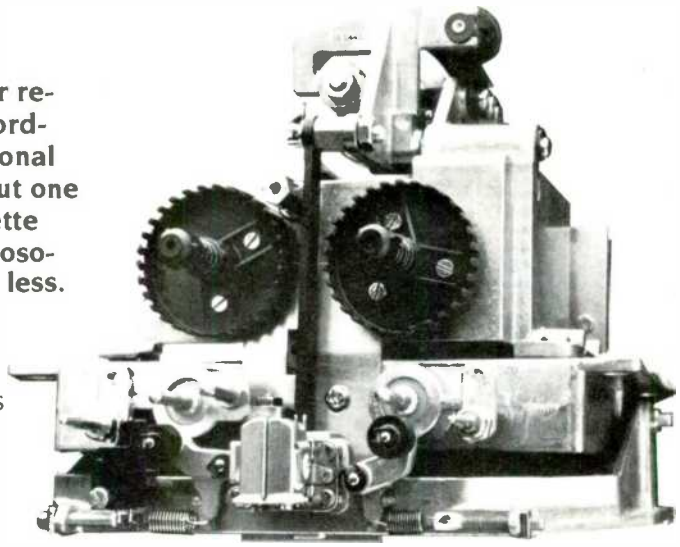
For consistently superior results in home audio recording, you need a professional tape transport. So we put one in the Revox B215 cassette deck. Our company philosophy would allow nothing less.



Studer Revox of Switzerland is the world's leading supplier of audio tape decks to recording and broadcast studios. Every transport we build adheres to the same strictly professional design criteria. The B215 is no exception.

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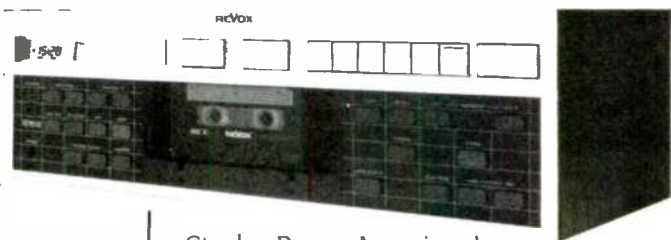
2. *Direct Drive Motors*–The only alternative is belts and gears, both of which degrade performance over time. To avoid such compromises, the B215–and only the B215–has *four* tape drive motors: two quartz-locked Hall-effect motors for the dual capstans, and two microprocessor-controlled DC spooling motors.

3. *An Azimuth Stable Headblock*–This is difficult to achieve in the cassette format because the headblock must move in and out of the cassette shell. Nearly all other decks use an inherently unstable "sled" mechanism. But the B215 uses a pivoting die-cast headblock mounted on precision bearings (.001 mm tolerance) to assure the stability required for optimum high frequency response.

4. *Gentle, Safe Tape Handling*–An on-board microprocessor (one of three) monitors all tape motion in the B215. Optical servos govern the spooling motors to give constant winding speed, controlled tape tension, and smooth tape wrap. The motors gently slow the tape just before the end to prevent tape-stretching jerks. Tape damage of any kind is virtually impossible.

Such uncompromisingly professional transport design brings extraordinary performance to the home recordist: incredibly low wow-and-flutter, extended frequency response, and consistently repeatable results time after time, year after year.

For one astute listener's evaluation of the B215's sonic qualities, please note the review in Volume 8, #7 of *Stereophile*. Reprints are available on request to the address below.



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STUDER REVOX

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How could Denon use so many widely spaced accent mikes and avoid ruinous phase problems? With a time-alignment unit that adds digital delay.

the earlier B & K series of precise measurement mikes. In my living room, I was bowled over by No. 5's brass sound; I have never heard very loud brass with *that* sort of clean, sharp edge and bite before, except, of course, in the concert hall.

Now for the payoff. All those other mikes were single cardioids, with heavy cables and weights to keep them in position. Every one was a new Brüel & Kjaer, first used, I think, in these recording sessions. They were a lightweight pencil type, and I saw the telltale re-entrant slots below the head as I held one in my hand. This mike, Denon says, matches the quality of the B & K omni, and the two blend remarkably well.

But how can they use 22 single, widely spaced "assistant microphones," as Denon delicately calls them—the equivalent of our accent mikes, sweeteners, and what have you—spaced out dozens, hundreds of feet from the main mikes? Ruinous phase problems! The close-up "assistant" sound would register before the distant pickup of the main stereo; the sound patterns would be dismally muddied.

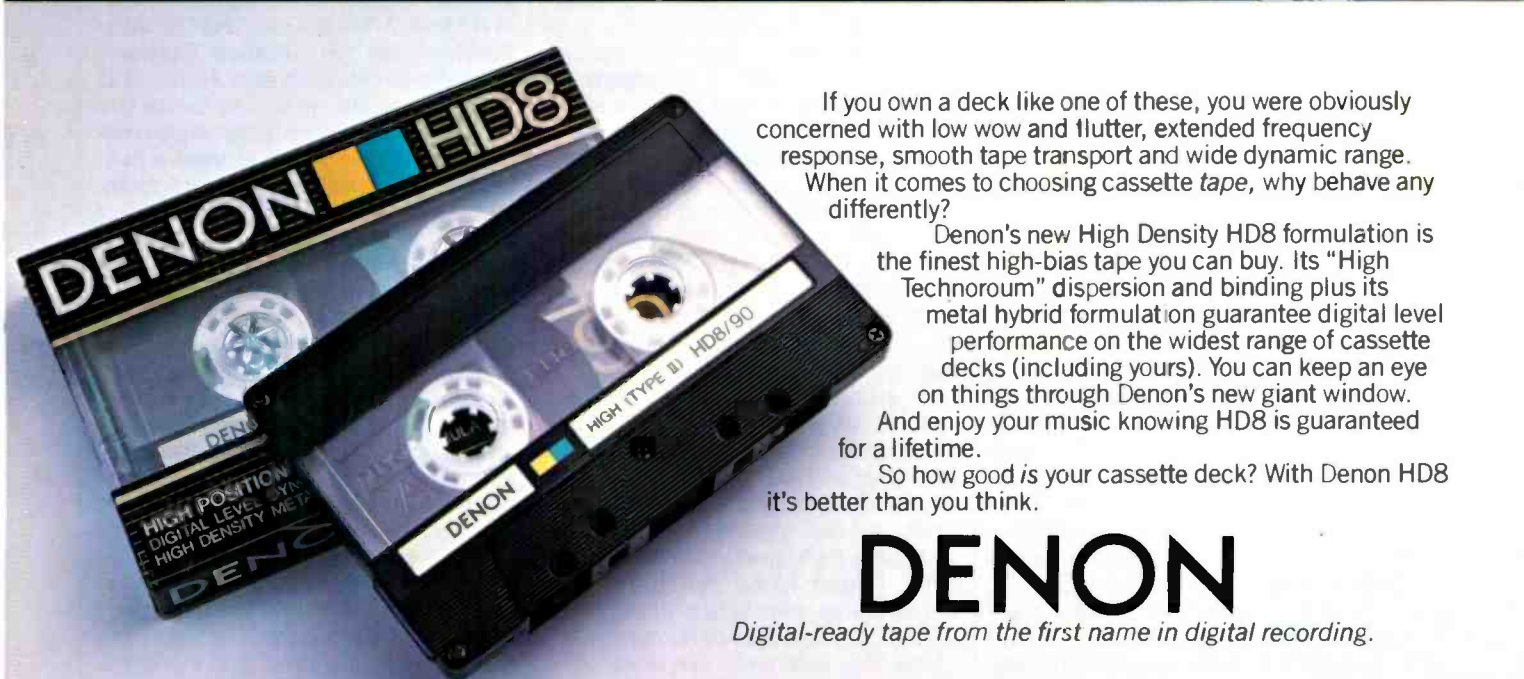
Well, I hate to say so, but I think our Japanese friends have got the jump on us again: The Denon Digital Time Alignment Console, also developed mainly during this recording series, adds *digital delay*, for all those mikes, before mixing.

But 22 of them? Only nine delay units are available at the moment, but Denon was ingenious again, in how they used them, with a simple idea that you and I might not have thought of. The assistant mikes for the big Eighth Symphony were *grouped by distance* from the main stereo mikes, perhaps deliberately set up with a tape measure. There were three such groups, each with its particular distance, fed into three of the Denon delay modules (which look like so many Dolby plug-ins). Thus, you see, you have your cake. The assistant mikes can be used to sharpen and clarify the various sonic colors and yet, regardless of those vast spaces, be precisely and clearly blended in phase with the main stereo signal. For the ear, the combination is perceived as one sound, unmuddied and unambiguous.

Denon is very sparing in its use of these assistant mikes, however many there may be, and still thinks of its Mahler stereo as one-point. If you doubt this, just listen to Symphonies No. 5 and onward. In all these, if I am right, there are long passages where the assistant mikes are not used at all, and there is no audible indication of their circumspect "entrances." Just try to hear them. You won't.

More details of the Denon procedure will follow. And more about the Alte Oper, the hall where live music sounds like a recording—a *good* recording, of course.

CHOOSE YOUR CASSETTE TAPE AS CAREFULLY AS YOUR CASSETTE DECK.



If you own a deck like one of these, you were obviously concerned with low wow and flutter, extended frequency response, smooth tape transport and wide dynamic range. When it comes to choosing cassette *tape*, why behave any differently?

Denon's new High Density HD8 formulation is the finest high-bias tape you can buy. Its "High Technoroum" dispersion and binding plus its metal hybrid formulation guarantee digital level performance on the widest range of cassette decks (including yours). You can keep an eye on things through Denon's new giant window. And enjoy your music knowing HD8 is guaranteed for a lifetime.

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BERT WHYTE

HEAD OF THE CLASSICS

Illustration: Kim Wilson Eversz

In the brief span of its existence, the phenomenal success of the Compact Disc has had a most profound impact on recorded music and the listening habits of millions of people. The serious music lover/audiophile who acquires a CD player usually develops an immediate appreciation of the performance potential of CD, and begins to consider the acquisition of a basic CD library of classical music. In this respect, there are many people who still resist the attractions of CD because they feel the medium is too new. They think there has not been enough time to develop a comprehensive catalog of CD recordings of the basic classical repertoire. Nothing could be farther from the truth!

As a matter of fact, considering the short history of the format, an extraordinarily large and very diverse catalog of classical music is now available. If anything, there is an embarrassment of riches, and it is more a question of whether one has the wherewithal to acquire all the recordings that would be desirable for a basic library.

Even if an audiophile is well organized, building such a library is a very ambitious and formidable undertaking. Let us give our music lover a helping hand, and show him the scope and dimensions of his task in the selection of music and choice of recordings.

Needless to say, there are certain basic considerations in choosing a particular recording of a work of music; there is also the matter of individual taste. To the musically erudite, the performance of a work is of paramount importance. To trained listeners with a high degree of aural acuity and sensitivity to sonic anomalies, the sound quality of a recording is the primary consideration. In the best of all possible worlds, every recording would be a splendid sound and glorious performance. But in the real world, alas, this ideal is rarely encountered. Thus, we must often choose a recording that features a great performance but has poor sound quality, or vice versa. Advocates of performance values and those of sonic virtues vehemently defend their viewpoints. It has been going on for ages, and it is really a moot point. In my experience, especially with really high-quality component systems, I have found that bad sound considerably diminishes the musical values of an inspired performance and blunts the emotional response to it. Therefore, although I can hear the cries of outrage, I would say that in a modern music-storage medium capable of technically superior sound, I would opt for a recording that provides that kind of sound even if the performance is somewhat flawed. I do not mean that I would want to hear a really botched-up, choppy, hopelessly incompetent performance. But not every conductor can give us transcendent performances. Especially for the less musically trained listener, there are many recordings that have good, if not outstanding, performances but which provide much pleasure because of their superb sound.

With the foregoing remarks and observations serving as a sort of guide, we can get down to the essentials of putting together a CD library.

Traditionally, the "three Bs"—Bach, Beethoven, and Brahms—have been the cornerstones of the classical music repertoire, and they will serve equally well as a foundation for a CD library. J. S. Bach should be represented by CD recordings of his "Goldberg Variations" and the "Brandenburg Concerti." (Just to appreciate some of the problems of assembling a library, note that even this early on in CD history, there are 11 different versions of these concertos!) The Bach section should include "The Art of the Fugue," "Mass in B Minor," "Magnificat," the "St. John Passion," the "St. Matthew Passion," the famous "Toccata and Fugue in D Minor" for organ, as well as four or five CDs devoted to other Bach organ music. Nor can we forget at least a half-dozen of the better known cantatas, along with another five or six CDs of concertos for various instrumental combinations, and the famous "Suites for Unaccompanied Cello."

The musical genius of Beethoven is represented on CD by recordings of all nine of his monumental symphonies (here too, choice is difficult, with 17 recordings of his Fifth Symphony and 14 versions of his Seventh vying for attention). We must acquire CD recordings of his five great piano concertos, the violin concerto, at least four or five of the late string quartets, and an equal number of the most famous piano sonatas and overtures. The collection should be rounded out with the great "Missa Solemnis" and the opera "Fidelio."

Sansui's AU-G77XII amplifier is rated superior for CD reproduction.

Sansui X-cels in digital performance. Our new AU-G77XII amplifier reproduces digital signals more accurately because our X-balanced circuitry delivers more headroom—without clipping. With ordinary amplifiers you need massive amounts of power to react to the pulse-like transients produced by digital discs. But with Sansui's X-balanced circuitry, our AU-G77XII handles digital peaks and low impedance loads with no problem.

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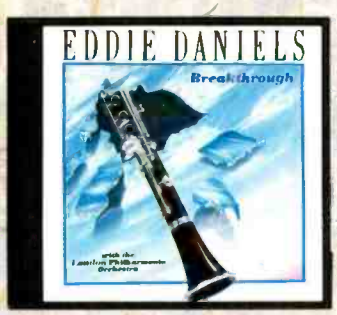
Diane Schuur/*Timeless*

Kevin Eubanks/*Face to Face*

Lee Ritenour/*Earth Run*

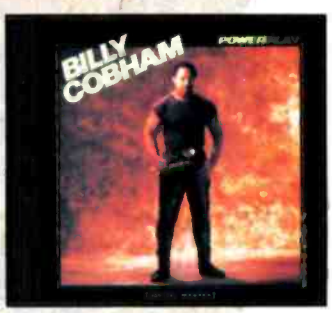


Eddie Daniels/*Breakthrough*

Glenn Miller/*In The Digital Mood*

Dave Valentin/*Light Struck*

Grusin/Ritenour/*Harlequin*



Billy Cobham/*Power Play*

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The Chick Corea Elektric Band

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To appreciate some of the problems in assembling a CD library, consider that there are 11 versions of Bach's Brandenburgs and 17 of Beethoven's Fifth!

No collection would be complete without some of the music of Johannes Brahms. I would recommend his four symphonies and two piano concertos, his tuneful violin concerto, the towering masterpiece that is his "German Requiem," the lilting "Hungarian Dances," and the stirring "Academic Festival Overture."

These days, a CD library should expand to some other famous "Bs"—Berlioz, Bruckner, and, for a little modern touch, Bartók. The most famous Berlioz work is his phantasmagoric "Symphonie Fantastique," of which there are 17 CD recordings available. A Berlioz collection would also have to include his vast "Requiem," along with "Romeo and Juliet," "Harold in Italy," "The Damnation of Faust," and a half-dozen of his sprightly overtures.

The Fourth Symphony of Bruckner is probably his most popular and accessible work, and there currently are eight CD recordings of it. His Seventh, Eighth and Ninth Symphonies are cast on a grand scale, and fortunately there are a number of splendid recordings of all of them on CD.

Béla Bartók is represented on CD by his masterful "Concerto for Orchestra," his two violin concertos, the third piano concerto, the bloodcurdling "Miraculous Mandarin" ballet, the opera "Bluebeard's Castle," the lively "Dance Suite," and "Music for Strings, Percussion and Celesta."

As you can readily see, putting together a reasonably comprehensive CD library of classical music is an arduous and obviously expensive undertaking. Thus far, we have only covered the basic "three Bs" plus three others, and have already accumulated quite a large stack of Compact Discs.

To put a fine point on the magnitude and complexities of this project, let us consider the music of one of the most popular composers, Tchaikovsky. Of his six numbered symphonies, all but the Third (the "Polish Symphony") are available on CD, most of them in multiple versions. Thus far, his great "Manfred Symphony" has not yet appeared on CD, but virtually all of his most popular works are available, including "Capriccio Italien," "1812 Overture," "Marche Slav," "Romeo and Juliet," "The Nutcracker," "Francesca da Rimini," "Swan Lake," "Sleeping Beauty," and of course his beloved "Concerto No. 1 for Piano and Orchestra" and "Concerto for Violin and Orchestra."

It should be noted that although some composers wrote a great many symphonies, not all of the music achieved great popularity. For example, Mozart wrote 41 symphonies, but only Nos. 35, 36, 37, 38, 39, 40, and 41 are frequently performed. All of these are available on CD. Similarly, Schubert composed 10 symphonies, but only the famous "Unfinished" Eighth and "Great" Ninth are really popular; these are available in multiple versions on CD. Haydn wrote 104 symphonies, and of these, about a dozen, mostly the late symphonies, are currently available on CD.

Among the symphonies that would be essential to a CD library are Mahler's Ninth and his unfinished Tenth; Mendelssohn's Fourth; Schumann's Fourth; Sibelius' Seventh; the Dvórák Seventh, Eighth, and Ninth; the Rachmaninoff First, Second, and Third, and Prokofiev's Nos. 1, 5, 6, and 7. Shostakovich wrote 15 symphonies, and thus far all but Nos. 2, 3, 4, 14, and 15 are on CD. Needless to say, there are many other symphonies that would be included in the basic CD library.

To the symphonies must be added the tone poems and individual instrumental works, such as Richard Strauss' "Don Juan," "Ein Heldenleben," "Till Eulenspiegel," "Death and Transfiguration," and "An Alpine Symphony." Then there are the Stravinsky "Firebird," "Petrouchka," and "Rite of Spring" ballets, the many works of Ravel, Rimsky-Korsakov, and Debussy, to say nothing about the music of Gershwin, Copland, and others. To all this must be added the voluminous literature of the great piano and violin concertos, solo and chamber works, oratorios, and dozens of operas. Listing all of them is obviously beyond the scope of this column.

Suffice it to say that we are talking about more than 450 Compact Discs. At $15 each, the cost of acquiring them all is a rather breathtaking $6,750! Perhaps if enough interest is expressed, I'll compile a basic classical CD discography and provide specific recommendations of my choice of recordings.

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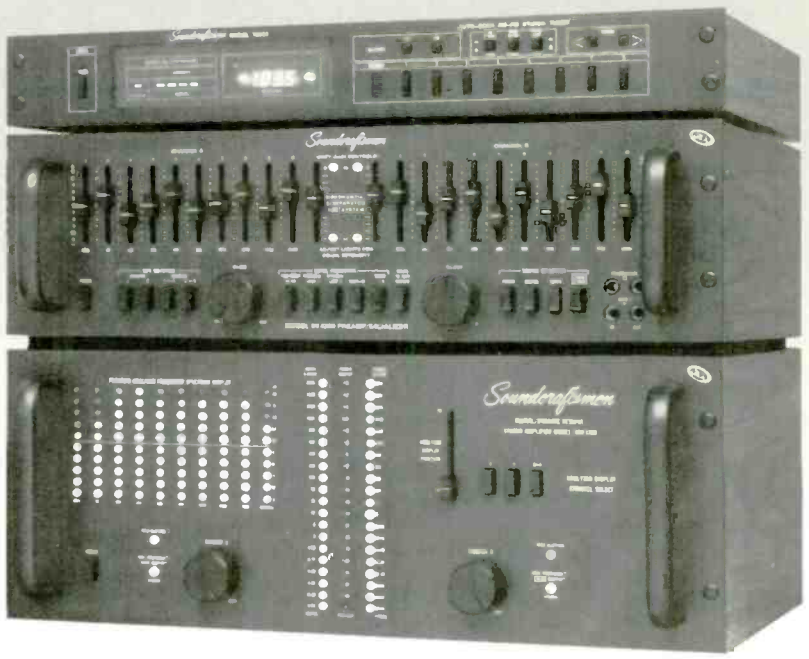

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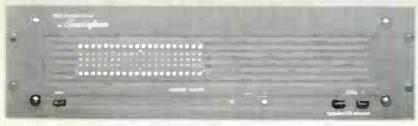

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PM840 Power Amplifier, MOSFET stereo, features no-current-limiting power supply, **300** w/p/c RMS into 4 ohms; 450 w/p/c RMS into 2 ohms; 205 w/p/c into 8 ohms @ <0.05% THD; Freq. resp. 20 to 20,000 Hz ±0.1dB; S/N >105dB; slew rate 50 V/microsec; TIM unmeasurable; damping factor 200.
8½"W x 5"H x 12"D; 22 lbs. **$499**

PCX-1, 5¼" x 19" Rack Mount/Cabinet kit, for PM840, shown installed. 11 lbs. **$49**

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PCR800 Power Amplifier, MOSFET stereo, **205** watts per channel continuous RMS 20–20,000 Hz into 8 ohms <0.05% THD; TIM unmeasurable; S/N –105dB; 8½"W x 5"H x 12"D; 22 lbs. **$449**

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A5001 Power Amplifier, Same as A5002 except no Meters and no Input Level controls. 50 lbs. **$749**

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19"W x 5¼"H x 10½"D, 30 lbs. **$649**

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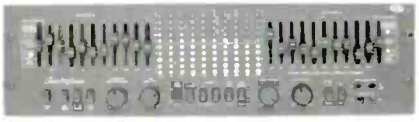
Signal Processors



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DC2215 Differential/Comparator® Equalizer, Stereo 10-band, with Differential/Comparator® True-Unity-Gain circuitry for Input-to-Output balancing accuracy to within **0.1dB.** Equalizer filter circuits use precision wire-wound Passive-Coil Inductors for high gain, low noise and distortion. Front panel controls include Tape monitor, LED defeat/EQ defeat and EQ Tape Record. THD and IMD <0.01% at 2 V; S/N ratio 144 db at 10V; boost/cut range ±15 dB, max 22dB. Includes Frequency Spectrum Analyzer Test Record, Computone Charts, Cables.
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DC2214 Differential Comparator Equalizer. Same as DC 2215 except equalizer filter circuits have op-amp synthesized inductors. THD and IMD <0.01% at 2 V; S/N ratio 106 dB at 10 V; boost/cut range ±12 dB, max 18 dB.
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DX4000 Preamplifier. Same as DX4100 without graphic equalizer but with 3 external signal-processor loops.
19"W x 3½"H x 11"D, 15 lbs. **$399**

DX3000 Preamplifier, Inputs for CD player, Video/Audio, Tuner, Phono, Two Tape Decks with dubbing, Bass and Treble controls, and signal processor loop. THD .01%, S/N 95 dB.
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IVAN BERGER

PRESSING PLANS

Illustration: Rosalind Ivens

Will there ever be enough Compact Discs? The number of discs produced each year keeps growing—but so does the number of CD players the CD pressing plants have to feed.

By the end of 1986, enough new plants were scheduled to have come on stream, and enough old plants expanded, to yield a capacity of about 266 million discs per year. That figure includes about 144.7 million per year from Oriental plants (all Japanese, except for Korea's Sunkyong), 37.9 million in the U.S. and Canada (about 9 million fewer than had been projected in early 1986), and 83.5 million from Europe. This is a substantial jump from 1985, when the total was only about 82 million CDs (45 million from Japan, about 5 million from the U.S., and about 32 million from Europe).

Because of the rapid buildup in ownership of CD players, even this expansion may not ensure enough CDs to satisfy all buyers. But even if it doesn't, more plants should mean more titles.

Some CD plants are working at or about 100% capacity during the present shortage. PolyGram's plant in Hannover, West Germany, for example, has gotten special permission from the German government to operate on Saturdays and Sundays. The government granted this permission on condition that PolyGram would give the extra shifts to previously unemployed workers and give those workers preference for regular-shift jobs.

By 1990 or so, supply could outpace demand. If all the projected CD plants and expansions that have been announced come through, production capacity three years from now could be nearly 900 million discs—about 200 million in the Orient, 265 million in Europe, and a whopping 435 million in the U.S.

Fewer discs than that will be produced, of course. Except in times of shortage, like the present, few factories ever work at full capacity. So actual production will probably be less than plant-capacity figures would suggest. PolyGram predicts that worldwide CD sales (as opposed to raw capacity) will be only 700 million by 1990.

Even so, and assuming that plants not yet publicly announced will be balanced by announced plans that do not reach fruition, tomorrow's capacity for pressing CDs will probably be greater than today's LP production. In the banner year of 1984, according to the Recording Industry Association of America (RIAA), about 205 to 210 million records were pressed in the U.S., and another 18.2 million LPs were imported—accounting for about half of all recorded music sold here, when cassettes and that year's handful of CDs are counted. So if CDs were to take over the entire recorded-music market by 1990, there would be just about enough domestic product to go around. Even if CD does not take over, CD-ROM and CD-I may account for any excess production capacity.

Several factors could limit CD's growth, however. One is the imminent competition from DAT, a more pocketable format that answers the demand for a digital medium which home users can record on. Another factor is the number of CD players in use, still far fewer than turntables, though gaining rapidly.

The major roadblock is that CDs cost far more than LPs, but this may soon change. A number of companies (such as Comdisc, Polyform and LaserLogic in the U.S., DocData and Teldec in Europe, and Matsushita in Japan) are working on new, lower cost production systems. Even without new systems, normal manufacturing advances should lower the cost per disc. With increased experience, manufacturers learn how to make more good discs per run, with fewer costly rejects. In addition, as the capital costs of starting up each plant are amortized, less overhead is added into each disc's price. Increased experience should also lower the price of CD manufacturing equipment, reducing the capital and overhead factors for discs from future plants. Already, at least one label has announced budget CDs with list prices of only $12 or $13—still high, but markedly lower than the $25 or so charged for CDs a few years back, or the $15 to $17 "discount" prices charged for most CDs today.

So there probably will be enough CDs. With luck, we'll even be able to afford them.

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The best CD Player is a matter of opinion. Many opinions.

probably give outstanding service for a long time.

•Finally, the Denon DCD-1500 tops my list. It's the player I recommend most highly. It has oversampling, dual D/A converters, remote controller, formidable specifications, full features, and Denon sound. The Denon engineers who created it should be honored in public.

Test: CD-Spieler Denon DCD-1500

Feuer und Flamme

...r Welt wollte Denon ...ine Palastrevolution.

DENON DCD-1500
typically £399

The current range of Denon players covers the ground from true budget to audiophile models. The DCD-1500 fits bang in the middle of the range as far as price is concerned and could best be described as being a full-feature domestic machine that is built with audiophile attention to detail!

Rather like the second generation of Sony players, the Denon uses separate converters for the two stereo channels ...her than time-sharing the o... therefore escapes ... phase problems of ... approach. The ... twice oversampli... has two specially ... phase filters bu... back board insl... correction is vi... the chosen ... Burr-Brown.

The circu... that each se... has its own ... oow... ...n digi...

...ärwicklungen die ...Mechanik, den ...gangsver-

Rich, atmospheric sounding player

The Real Deal

This Denon DCD-1500 is well designed throughout. Everywhere you look you'll see signs of careful engineering and evidence of the willingness to spend the extra time and money to do the job right. The Denon engineers who created the DCD-1500 have done a superb job.

In features, design, and sonics, the DCD-1500 is an outstanding player at any price, and a phenomenon at its list price. In my opinion, it's the best deal in today's CD player market. ⊡

Ken Pohlmann is a contributing editor to Digital Audio.

Construction	■■■■□
Ease of use	■■■■■
Sound quality	■■■■■
Value for money	■■■■■

...under remote control.

The facia has to pack in a lot of buttons but remains fairly easy to understand. The main Search and Skip controls are in a strip in the centre bottom of the player. The keypad is duplicated to the right side of the comprehensive display while the Repeat, memory call and clear functions are up with the Play, Pause and Stop controls on the top right. The display gives continuous read-out of Track/Index numbers, time and a 0-20 track grid.

...k access was not particu... ...my test being ...

Beispielsweise speist der klo... zige Netztrafo mit vier einzel-

...correction once or twe... highest information ...ayer ga... test. The equivalent ...evel sur... face mark and fingerprint tests were cleared without problems.

Hayden Labs, importer of Denon, has said that current production of the DCD-1500 is being changed to incorporate better RF screening — no problems were encountered with our sample during the review.

Hayden Labs Ltd
Hayden House
Chiltern Hill
Chalfont St Peter
Bucks SL9 9UG
☎ (0753) 888447

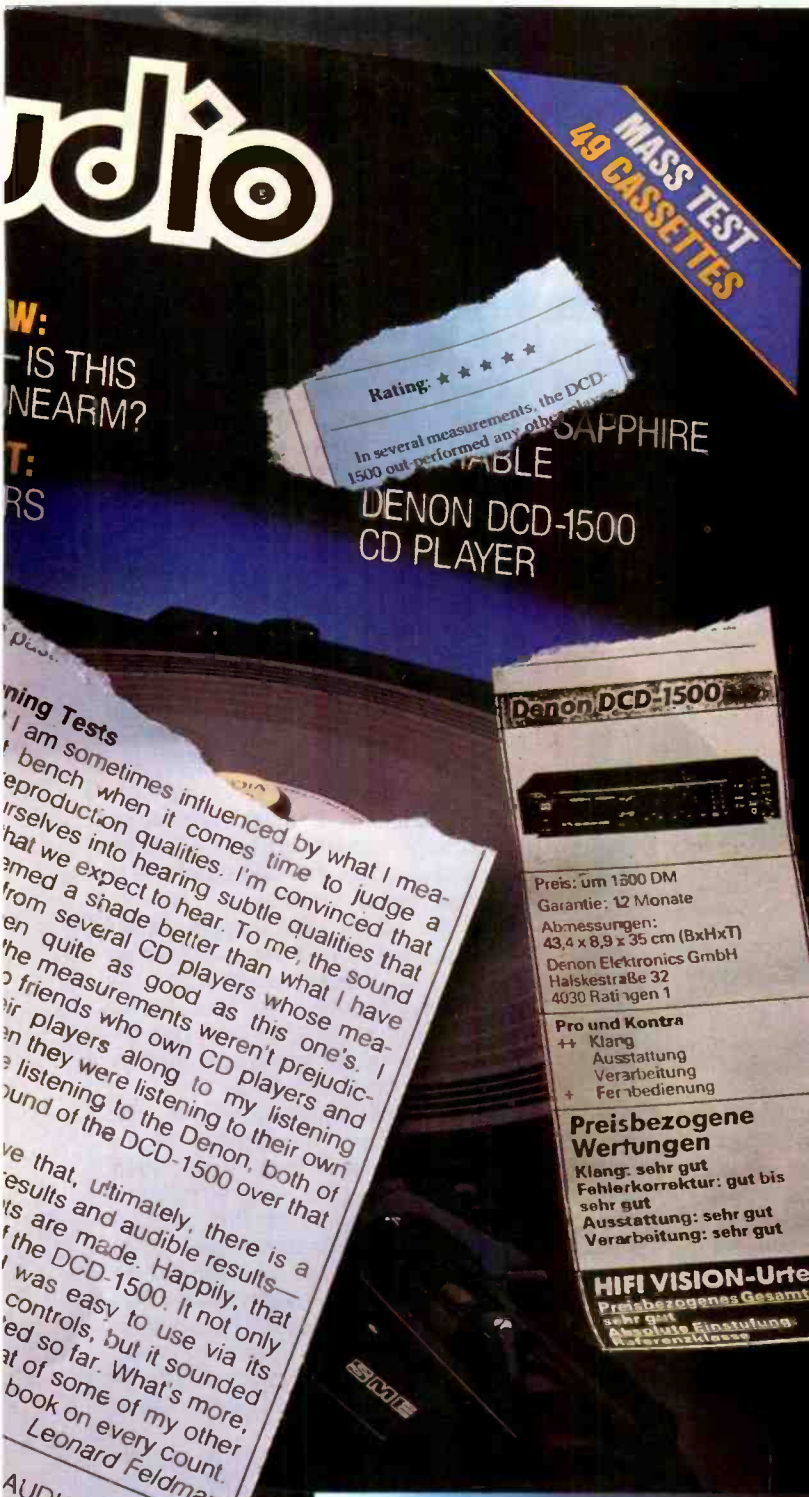
...player in t...

Use and Lis...

I suspect th... sure on the te... product's sound... we can "psych" ... we want to hear, or... of the DCD-1500 s... been hearing of late... surements haven't b... wanted to be sure tha... ing me, so I called in t... asked them to bring th... room. Without knowing wh... players and when they we... these friends preferred the ... of their own.

I've always wanted to beli... correlation between measured ... providing the right measureme... contention held true in the case ... performed well on the bench an... remote control or via its front-pane... as good as any CD player I have te... its price is a good deal lower than t... favorite CD players. It is a winner in m...

DenonAmerica, Inc., 27 Law Drive, Fairfield, NJ 07006
Denon Canada, Inc., 17 Denison Street, Markham, Ont. L3R 1B5 Canada
Reviews reprinted with permission. (*Digital Audio* 3/86 and 6/86; *Audio* 6/86).



The audio critics of the world hardly ever agree on anything. But when it comes to superlative CD players, Ken Pohlmann, Len Feldman, Masamitsu Fukuda, Ulrich Smyrek, David Prakel, Yoshiyuki Ishida, Artur Jung, and Hideo Kaneko recommend one model with amazing consistency: the Denon DCD-1500.

How did Denon achieve this exalted status? Not by offering useless buttons, switches and fluorescent displays. But by developing better digital circuitry, building to higher standards, and using better parts. Our proprietary Super Linear Converter is the only one that actually corrects D/A transfer distortion. Each circuit gets its own separate power supply. And our filters are computer-analyzed for linear phase. So you hear sound that rewards the most critical listening.

In a player as reasonably priced as the DCD-1500, these refinements are enough to make even a hard-boiled critic stand up and cheer. And now there's more cause for celebration: three new Denon CD Players. They're built on the same principles as the DCD-1500, and they're even more affordable.

So if you want to hear the best that the Compact Disc format has to offer, get yourself to a Denon dealer. And don't forget to tell him who sent you: Ken, Len, Masamitsu, Ulrich...

DENON

DESIGN INTEGRITY

Enter No. 18 on Reader Service Card

DCD-1500: Dual Super Linear Converters; Oversampling Digital Filters; CALP Analog Filters; Programming; Remote Control.

DCD-1300: Super Linear Converter; Oversampling Digital Filters; Real-Time Phase Correction; Programming; Remote Control.

DCD-700: Super Linear Converter; Real-Time Phase Correction; Programming; Remote Control; Headphone Jack with Level Control.

DCD-500: Super Linear Converter; Real-Time Phase Correction; Programming; Emphasis Display; Headphone Jack.

KEN POHLMANN

COMPACT TOY BOX

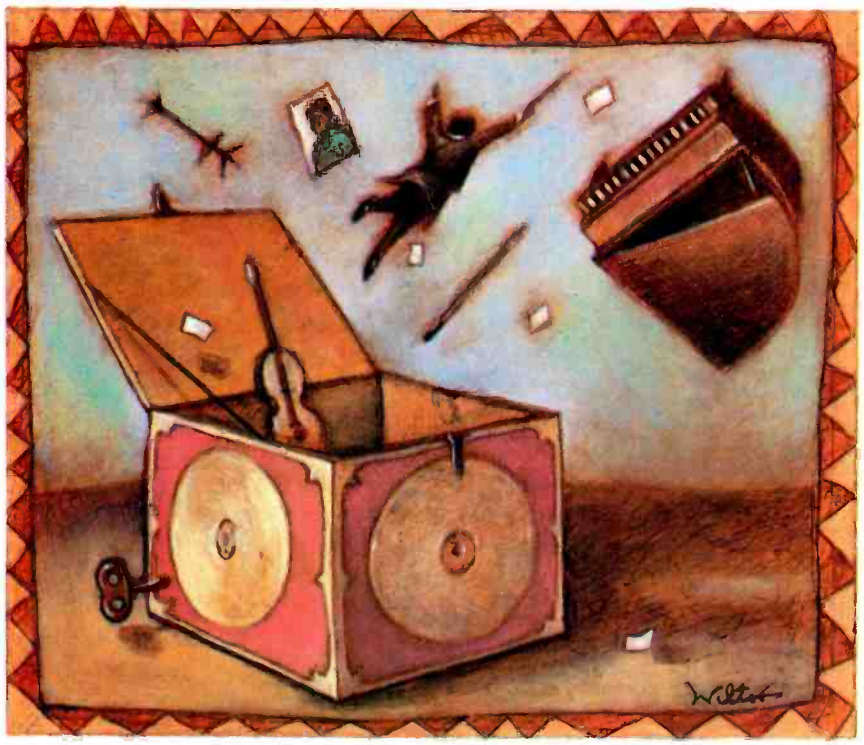


Illustration: Nicholas Wilton

Last month, we examined some of the ins and outs of the CD-ROM format, a primarily data-only application of the Compact Disc storage system. I'll bet a lot of people grumbled because the column had little to do with audio. This month (and next), we'll take a look at yet another incarnation of the Compact Disc. But don't worry; when it arrives, you will be able to listen to this one—as well as watch it, read it, and interact with it.

CD-I (Compact Disc-Interactive) is a special application of the CD-ROM format. Rather than store specific data, such as computer software (on a CD-ROM) or music (on an audio CD), CD-I will allow simultaneous storage of audio, video, graphics, text, and data, all functioning in an interactive format. The CD-I system is thus a multi-media extension of the digital audio found on CD-Audio discs. In addition, since CD-I players will be able to play regular audio CDs, CD-I can be thought of as an upscale CD-Audio system.

The CD-I format defines both hardware and software standards, much as the CD-Audio format does. Although CD-ROM can also store text, graphics, etc., CD-I specially defines an integration of those functions. Accessing CD-I will be an interactive procedure, a dialog. The system will present the user with alternatives, which he can then use to steer his way through the presentation to the desired information.

CD-I has rigidly defined implementations, just as the CD-Audio format does. The CD-I standard defines the following:

1. How various types of information such as video, audio, text, executable code, and graphics will be distinguished and identified.
2. How each type of information will be encoded, including specification for several formats of high-, medium-, or low-resolution video and graphics, and high to low-fidelity audio.
3. The file layout on the disc, and how files will be accessed.
4. How hardware will read discs and decode the contained multi-media information.

CD-I is specified in detail because it is aimed at the mass consumer market as a user-friendly, standardized system. It is thus important that all future CD-I discs be interchangeable and play in all future CD-I players.

CD-I is a single-medium system, containing both the operating program and the information itself, with no secondary media such as floppy disks required. In addition, CD-I is intended to piggyback on other electronic products, such as stereo systems or television sets, for multi-media presentation.

CD-I is designed to be used in a wide range of applications, from work to leisure, from entertainment to education. This diversity of intended applications posed a considerable challenge to CD-I designers, who responded with a system that incorporated a number of innovations. These diverse applications require the flexibility to select different levels of audio fidelity and of video and color resolution for various applications. This flexibility will allow storage capacity to be maximized and audio, video, and computer text to be presented simultaneously. Depending on the fidelity level selected, it will be possible to divide the audio into as many as 16 tracks, which can play either simultaneously (for multi-lingual or surround applications) or sequentially (for up to 18 hours and 40 minutes of monophonic sound).

Multi-media applications will also call for physical interleaving of the three basic types of data (audio, video, and text/binary) to ensure synchronized presentation of the different types. Finally, the disc will have to provide efficient storage for data that degrades gracefully (audio and video) and for data that does not (text/binary). The former requires maximum bandwidth for maximum capacity, while the latter requires extended error detection and correction.

The CD-I data format may be considered a subset of the CD-ROM data format. As shown in Fig. 1, CD-I players will be designed to read CD-I discs, all CD-Audio discs, and certain compatible CD-ROM discs. The CD-I discs will use two physical formats (referred to as forms), as shown in Fig. 2. Form 1 is intended for text, computer data, and highly compressed visual data; extended error detection (EDC) and correction (ECC) are used. The extended error-correction code used is the same as for CD-ROM Mode 1. In Form 1, user data occupies 2,048 bytes, and 280 bytes are reserved for the extended error-detection and error-correction codes. Form 2 is intend-

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CD-I can deliver audio, video, and computer data all at once; getting it to do so posed a considerable design challenge.

ed for real-time audio and video; EDC and ECC are omitted, and user data occupies 2,328 bytes.

To differentiate one kind of CD-I data from the other, a subheader is placed immediately after the regular 16-byte CD-ROM sync and address/mode header. The data is directed to the appropriate circuitry for reproduction, display, or processing. For example, audio and video data are directed to separate D/A stages (and, in video's case, to additional modulation stages). Because of its eight-byte subheader, CD-I Form 2 holds eight fewer user data bytes per sector than CD-ROM Mode 2 (2,328 versus 2,336). However, CD-I Form 1 holds just as much user data as CD-ROM Mode 1 (2,048 bytes), because the Mode 1 format includes an eight-byte space which is omitted from Form 1 to make room for the CD-I subheader.

The standard for CD-I specifies much more than the standard for CD-ROM does. The CD-ROM standard defines only physical format capability, which means that the data and file structure on specific discs may allow their use only with specific computer systems. A CD-ROM containing graphics or programs for an Apple computer, for example, could not be used with an IBM PC, and vice versa. By also specifying disc and content identification and file access parameters, designers of the CD-I system have ensured that all CD-I discs will be compatible with all CD-I systems.

In addition, a bridge exists between CD-ROM and CD-I, based on the CD-ROM Mode 1 format. Mode 1 discs containing text (as opposed to graphics or other specialized information)

Fig. 1—How CD-I will interact with CD-Audio and CD-ROM hardware and software. CD-I discs will contain audio, video, or computer data—separately or together. CD-I players will accommodate all CD-Audio discs and some CD-ROM discs.

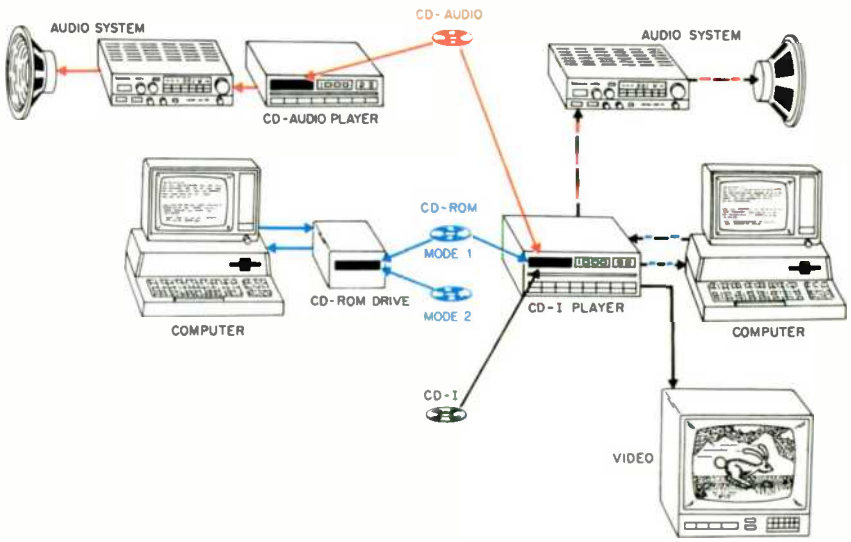
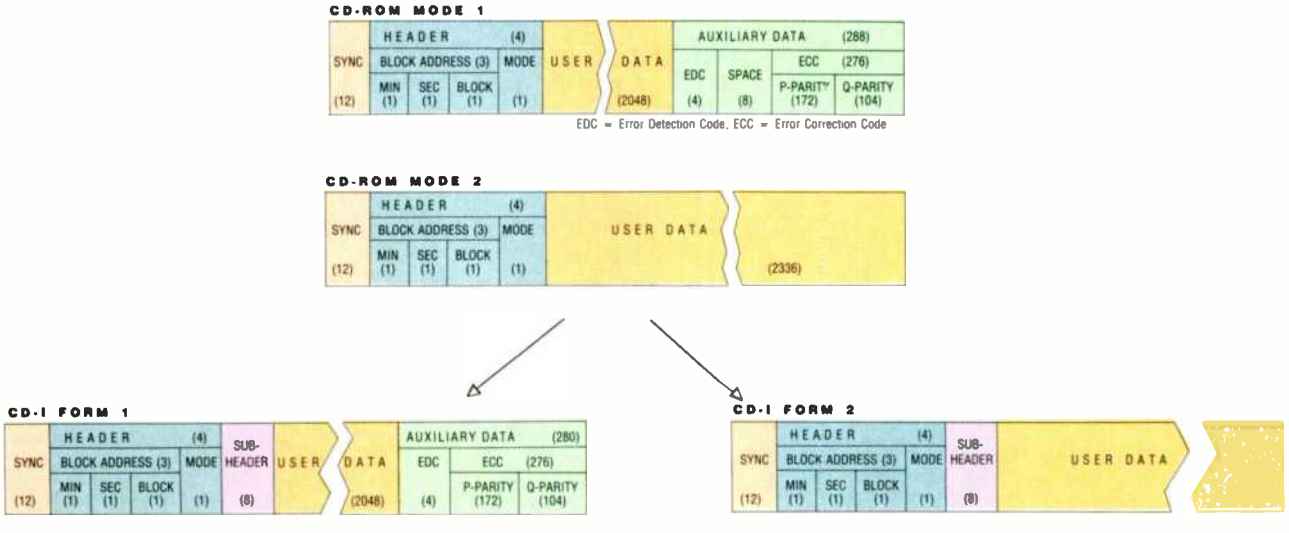


Fig. 2—A comparison of CD-ROM and CD-I data formats. All sectors shown are 2,352 bytes long, equivalent to 98 CD-Audio frames or 1/75 S.



Teac Compact Disc. HiFi in the extreme.

Teac is not in the habit of building audio equipment for the undiscerning. Rather, we commit ourselves to those few individuals discontented with anything less than the finest recording and sound reproduction equipment money can buy.

Before you stands the remarkable Teac ZD-5000. Perhaps the purest embodiment the compact disc player has yet experienced. A machine with a list of features and specifications so numerous, so advanced as to impress the most jaded audiophile. A machine so refined its output jacks are plated with 24k gold. And when it comes to remote controlled functions, nobody comes remotely close.

The Teac ZD-5000 compact disc player. "Fi" just doesn't get any higher.

TEAC

Enter No. 45 on Reader Service Card

Accessing CD-I is like a dialog. The system gives the user alternatives, which he can then use to steer his way to the desired information.

will be playable on both CD-ROM and CD-I systems. Surprisingly, CD-ROM Mode 2 discs will not be compatible with CD-I, even though (according to Philips) they form the basis of the CD-I system.

The CD-I format calls for a total storage capacity of approximately 650 megabytes. Because a CD-I disc will be recorded with constant linear velocity, a constant readout rate of 75 sectors per second will be achieved. This will result in a data transfer rate of 153.6 kilobytes per second for Form 1 and Mode 1, and 176.4 kilobytes per second for Form 2.

To allow for extended video information, data compression techniques can be used to reduce the storage space required for the encoded audio program. The CD-I format offers four levels of audio quality, to be selected according to the need for fidelity: A CD-Audio mode uses linear 16-bit PCM encoding, for the same stereo fidelity as regular audio CDs. Alternatively, eight- or four-bit adaptive delta pulse-code modulation (ADPCM) is used for three lesser levels of fidelity: "Hi-Fi" music mode, which approximates LP quality; "Mid-Fi" music mode, which approximates FM quality, and "Speech" mode, for AM quality. The CD-I format also allows for a special text-to-speech mode using phonetic coding to yield synthesized speech.

The option of trading away some audio quality in order to gain space for other data is an essential part of CD-I's ability to combine audio with video and text. Obviously, a full-fidelity, full-length audio program, as found on a CD-Audio disc, would consume the entire storage area. Using data-compression techniques on the audio information would free a lot of room for other stuff: 16-bit PCM with a 44.1-kHz sampling rate is extremely data-hungry, whereas four- and eight-bit ADPCM are much more efficient. An audio-only CD-I disc with ADPCM could contain nearly 19 hours of program in "Speech" mode. Next month, we'll discuss exactly how ADPCM is able to achieve this.

Meanwhile, I'll leave you with this taste of CD-I software: Imagine a CD-I disc about Beethoven. It could contain extensive textual information on the composer, show you pictures of him, and play examples of his music, perhaps while displaying the score. A bibliography might list all of the books written about Beethoven, a discography might list all Beethoven recordings, and a catalog might list all of his compositions—all of that on one disc, with friendly software to guide you to the information you want to access!

Or how about *Audio* magazine on CD-I, complete with text, visual and aural information, and advertisements that show, describe, and audition their products. Just think, you could even see pictures of the monthly columnists! (Well, maybe we'll skip that particular application.)

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Linn Turntable

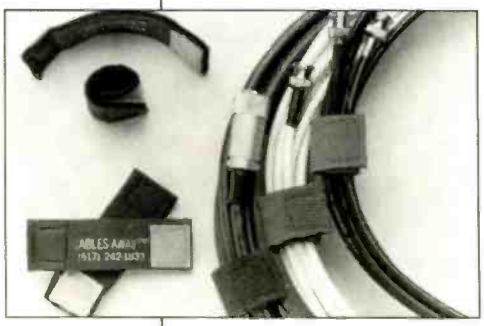
A biamplified, Class-A *turntable*? The new Linn Axis uses separate Class-A amplifiers to drive each of its two sets of motor coils. The motor operates at full power only until the platter gets up to speed, after which power is cut back in order to reduce motor noise. The three-point suspension system can be adjusted for a variety of tonearms. Price: $575 with Linn Basik LVX arm, $425 without.

For literature, circle No. 101

Apogee Acoustics Loudspeaker

Like all Apogees, the Caliper is a full-range ribbon loudspeaker system. A two-way design, its frequency response is rated at 30 Hz to 25 kHz and its nominal impedance is 3 ohms. Output level is rated at 105 dB (C-weighted, at 4 meters, in an 18 × 24-foot room); recommended amplifier power is 100 watts per channel. The cabinet is available in taupe or gray. Price: $1,650 per pair.

For literature, circle No. 100



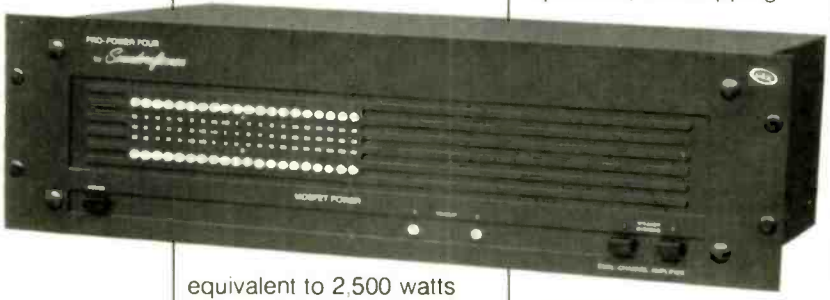
Playback Cable Ties

The more complex the audio or audio/video system, the more complex the web of cables behind it. Cable ties can be used to bundle those cables, but most such ties must be cut apart if the bundle is to be changed. Playback, Inc.'s Cables-Away, Neoprene straps with Velcro fasteners, can stretch to fit cable bundles more than 1 inch thick, and can be removed and reused as often as necessary. The straps are available in blue, red or orange. Price: $9.90 per bag of five.

For literature, circle No. 102

Soundcraftsmen Power Amplifier

The Pro-Power Four MOS-FET stereo amplifier is a high-current design, with instantaneous peak current capability rated at 50 amperes per channel, equivalent to 2,500 watts per channel into 1-ohm loads. Rated continuous power is, naturally, more modest—205 watts per channel into 8 ohms, 300 per channel into 4 ohms, and 450 per channel into 2 ohms, all at 0.05% THD, 20 Hz to 20 kHz. Rated bandwidth is d.c. to 100 MHz. The amplifier has switching for two pairs of speakers, true clipping indicators for each channel, and LED output metering. Price: $699.



For literature, circle No. 103

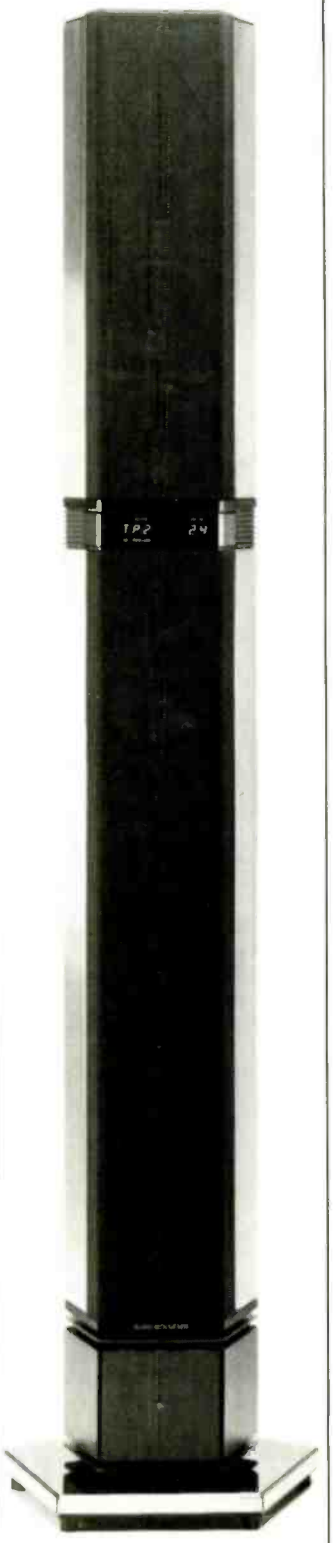
Bang & Olufsen System

The Master Control Panel for Bang & Olufsen's Beosystem 5500 is a two-way remote control—it not only sends commands to components, but receives and displays system status information such as tuner frequency or tape deck recording level. The system can be controlled from anywhere in the house, by either the master control shown or by a simpler, hand-held remote, with the aid of Master Control Links in additional rooms.

Audio signals can be fed to Beolab Penta speakers, self-powered, three-way systems using nine drivers in a line-source configuration. The slender, floor-standing speakers are five-sided and measure 65 inches tall. The cable that carries the signal to each speaker's built-in 150-watt amplifier also carries system status information (such as source and volume); this information is shown in a digital display on the speaker—a useful touch when the Beosystem is being controlled by the hand-held remote.

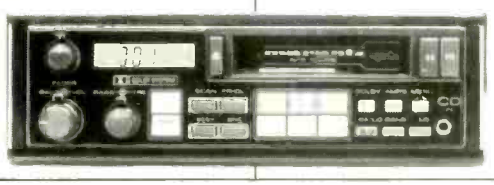
The chief system component is the Beomaster 5500 receiver, which delivers 50 watts per channel into 8 ohms at 0.09% THD. Its tuner section has 20 station presets (AM or FM, in any combination) and allows station frequencies to be keyed in from the front panel or from either remote control. Also available is the Beocord 5500, a drawer-loading cassette recorder with auto-reverse recording and playback, plus automatic selection of Dolby B or C NR when playing back tapes that were recorded on it. The Beogram CD50 Compact Disc player and Beogram 5500 linear-tracking turntable also can be used in the system.

Prices: Beomaster 5500 receiver with Master Control, $1,659; Beolab Penta speakers, $2,598 per pair; Beocord 5500 cassette deck, $899; Beogram CD50 CD player, $999 (plus $150 for remote control when not used with Beosystem 5500); Beogram 5500 turntable, $439.
For literature, circle No. 105



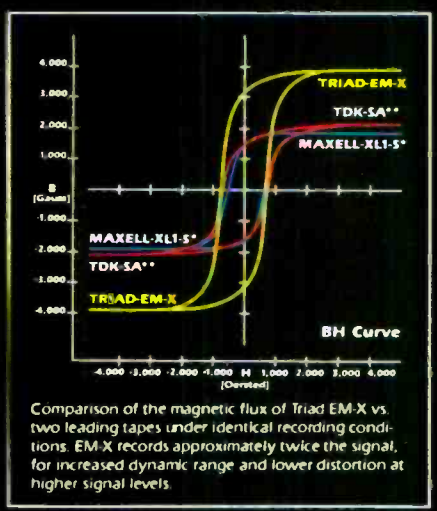
Marantz Car Stereo

A front-panel jack lets Marantz's CAR750 car-stereo head unit accept input from a portable CD player. Its radio section includes seek, scan, and manual tuning, plus six AM and six FM station presets; tape features include Dolby B NR and auto reverse. The amplifier section delivers 20 watts per channel at 10% distortion. Price: $299.95.
For literature, circle No. 104



TAPE IT TO THE LIMIT.

The dawn of a new tape decade.
The digital age has pushed recorded sound to the limit. Now Triad Digital Transcription Tape takes you there, too. It's the first totally new tape for your deck in a decade.



Comparison of the magnetic flux of Triad EM-X vs. two leading tapes under identical recording conditions. EM-X records approximately twice the signal, for increased dynamic range and lower distortion at higher signal levels.

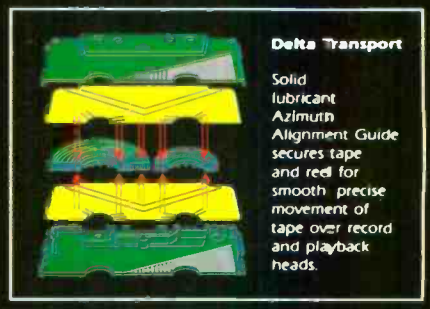
Leading tapes share limited, pre-digital formulas. They just don't measure up to today's advanced recording techniques and audio equipment.

Triad's exclusive, patented metal tape formulations deliver maximum performance with a composition of exceptionally dense, uniform ferrous hydroxide particles. Their increased surface area holds more signal with less distortion than previously possible.

Triad and true performance for every deck.
Unlike pre-digital tapes designed for sources with dynamics averaging only 45-50dB, Triad's advanced metal technology delivers over 80dB of exciting, true-to-life dynamic range. With Triad, tape decks can actually perform beyond the limits of their own manufacturers' expectations.

Triad MG-X's high retentivity and coercivity are optimum for metal position transcription of digital material. For true metal quality in the high (CrO_2) position, the EM-X's reduced coercivity and controlled retentivity deliver more high frequency headroom and dynamic signal with higher overload levels than any other Type II tape. And for the widest dynamic range with the flattest frequency response in the normal position, it's the cobalt-doped Triad F-X.

The housing that Triad built.
A revolutionary tape deserves a revolutionary tape housing. Triad's exclusive built-in Azimuth Alignment Guide guarantees precise tape-to-head contact for minimal tape skewing, extended



high frequency response and spatially accurate, three-dimensional sound. The unique Delta Transport housing also features a full-length, solid lubricant slip shield for less friction, reduced wow-and-flutter and prolonged tape life.

Triad Digital Transcription Tape. Three advanced formulations that tape you to the limit of today's recording technology.

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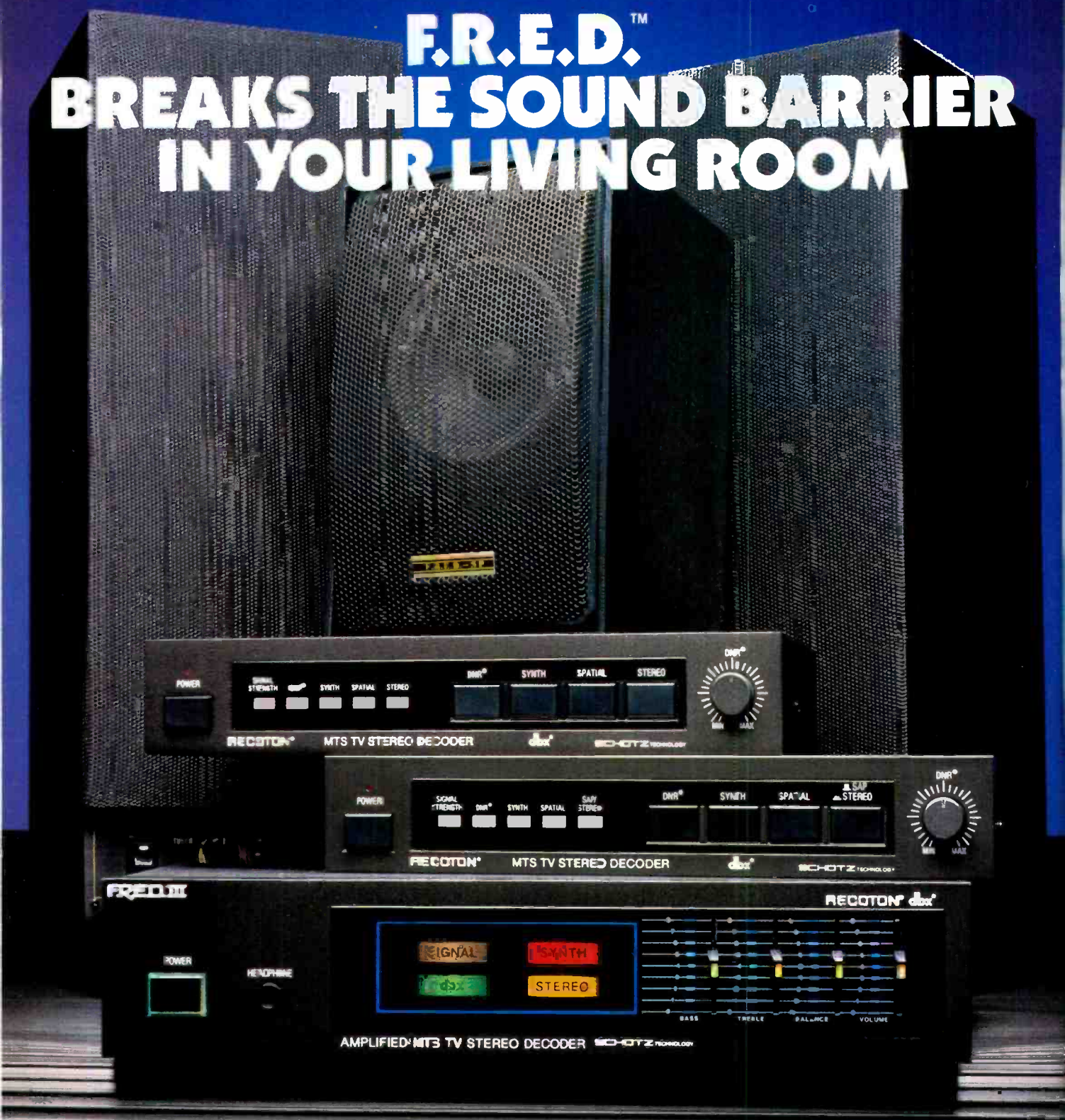


A view inside the tower, showing the antenna bays and some of the r.f. plumbing.

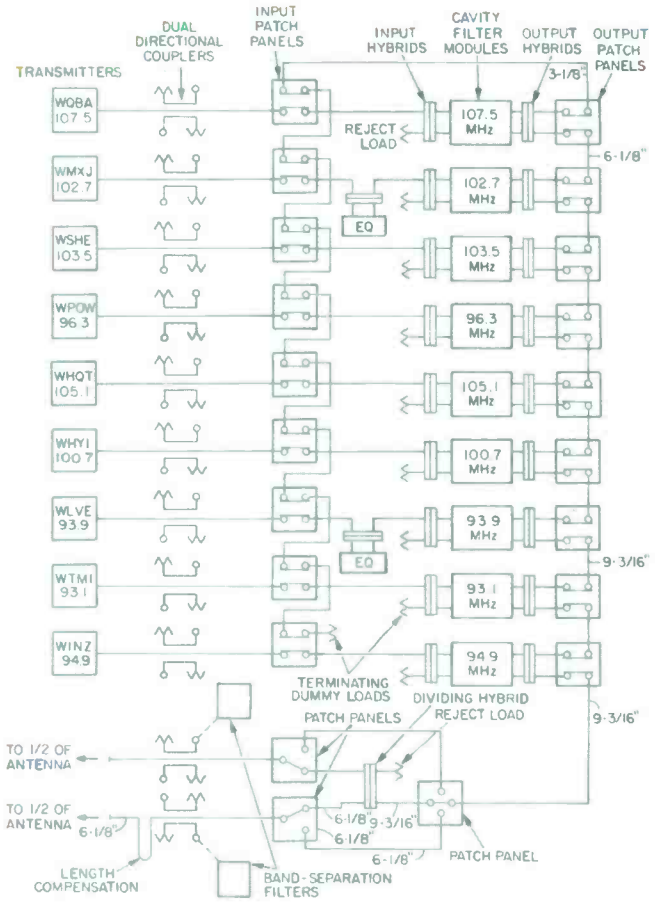


Fig. 1—Block diagram of the nine-station combiner.

modern dairy, a room full of anodized aluminum cabinets connected by fat copper transmission lines that look more like pipes than signal cables.

As Fig. 1 shows, the combiner is not so much a complex circuit as one simple circuit repeated nine times, once for each transmitter, feeding into another circuit that couples it to the antenna. Each transmitter's output first passes through a dual directional coupler, a circuit which allows the signal that the transmitter feeds into the combiner to be monitored automatically.

The signal then enters the combiner's input patch panel, which allows the combiner to be temporarily bypassed in case of failure. (For broadcasters, staying on the air, even when equipment fails, is vital.) The lower left patch of each panel provides access to the transmitter's output, so that the filter section (the input and output hybrids and the cavity module) can be bypassed in case of trouble. The lower right patch provides access to the filter section; a replacement transmitter would be plugged in here. The upper patches of each panel merely provide a signal path between the panels, eventually feeding to the broad-band (unfiltered) emergency input at the first output patch panel.

In the output patch panels, the broad-band signal—the sum of all the signals combined up to that point—is fed via the upper patches into the broad-band input port of a station's filter section, where that station's signal is combined with the ones already on

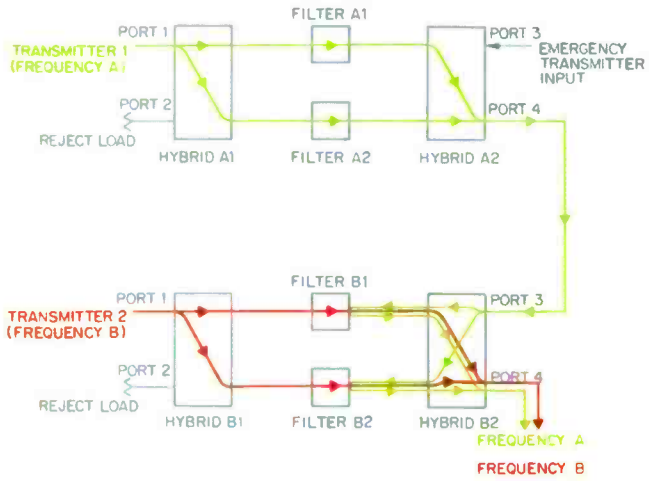


Fig. 2—How the combiner's hybrids and filters work. The signal from the first transmitter (Frequency A) is split by hybrid A1 and passes through filters A1 and A2, which are tuned to that frequency; then its two halves are rejoined at the broad-band output (port 4) of hybrid A2. This signal then passes through the combiner system's broad-band line to the broad-band input (port 3) of hybrid B2, the second transmitter's output hybrid. Hybrid B2 splits the Frequency A signal and passes it to filters B1 and B2. Since these filters are tuned to Frequency B, they reflect the Frequency A signal back into hybrid B2, where it joins Frequency B at port 4. The combined signals then go on to the next transmitter in the chain.

Interview:
Richard L. Edwards, WINZ Broadcast Engineer

Lewis T. Fineman

Problems can be opportunities in disguise. Such was the case for WINZ-FM, Miami, which turned a problem with its antenna site into improved FM reception for millions of South Florida listeners. In the process, the broadcaster also increased signal reach and fidelity for itself and eight other stations. Here, Richard L. Edwards, director of engineering for WINZ-FM's owner, Guy Gannett Broadcasting Company, tells how it was done.

What is the history of this tower project?

About five years ago, WINZ-FM, the local FM station of the Guy Gannett Broadcasting Company, got wind that tall buildings were going to be put up in downtown Miami. We were concerned because we knew that these buildings would degrade our station's signal.

Where were you operating at that time?

We were on the top of One Biscayne Tower, which is right on Biscayne Boulevard in the heart of downtown Miami. We decided rather quickly that we had to find an alternate site. We looked at the possibility of going onto one of the taller buildings as they went up downtown, but we decided that wouldn't work because another building would just come along that was even taller. Any way you looked at it, our signal would be obscured.

We started looking at alternate sites to see if we could find a location to construct a 2,000-foot tower, which is the maximum height allowed by the FAA and FCC. We found nothing. Then we tried to work out an agreement with a tower that was already in existence near the Dade/Broward County line. But we ran into complications with the FCC because that would put us too close to an adjacent-channel station in Riviera Beach. We then started to look for land to build a shorter tower on, and found a piece of property after a two-month search. When we found the land, we had FAA approval in 10 days for building a 1,049-foot tower. The FCC took longer: We filed our original application in October of 1982, and then refiled after some changes in the laws. Final FCC approval to begin operations was given on January 31, 1985, and WINZ-FM was broadcasting from the tower by that afternoon.

While all this was going on, various other stations in the market were also applying to move from the downtown Miami area. They were receptive to moving with us when we found our location. This included WTMI, the local classical-music station, as well as other stations which had been located at our old site at One Biscayne Boulevard. When we started building, we had commitments from five FM stations and one TV station. The other stations began broadcasting from the new tower, one by one, starting the day after we did. [*Editor's Note:* There are now a total of eight, with another being added this summer.]

Did the tower have to be specially engineered for the site?

Oh, absolutely. There is no such thing as an off-the-shelf tower of this size. The tower has a 12-foot face, which means it is 12 feet from leg to leg. It is triangular in shape and is the heaviest thousand-foot tower constructed to date—3 million pounds at the base plate. The top-loaded FM antenna is also the heaviest ever constructed; it weighs 22,500 pounds. The directional antenna has six bays aimed to the north, six to the south, and two each to the east and west, to concentrate the signals up and down the Florida coast and around to the Keys. The signal's horizontal and vertical patterns had to be conformed to the antenna's location and surroundings.

The tower is also designed to handle a multitude of two-way radios and repeaters, pagers, taxicabs, and cellular telephones. As a matter of fact, even Cable News Network is going to have an operation on the tower, and the Coast Guard is talking about putting up a marine feed which will cover all the way to the Bahamas.

Once you had found the land, wasn't the tower put up very quickly?

It actually took just about one year. There has never been a tower put up as fast as this one, but that doesn't mean it has been put up in anything other than the best possible way. There is no tower built to this day, ever, that is as strong as this tower is. None have been built to withstand similar loads. This is a 100-pound-windload tower, which means that it can withstand any hurricane that comes through. It will watch the hurricanes come and go. The transmitter building at the base of the tower is also built to withstand hurricane winds. Everyone knows that South Florida building codes are very strict, but this transmitter building is of cinder-block construction with double the usual number of columns and beams. I have heard people say that this thing won't just withstand hurricanes, it will withstand tornadoes!

Who did you order the tower from?

Kline Iron & Steel in Columbia, S.C. They are steel fabricators who have done some rather famous things, such as the Mount Sutro Tower in San Francisco; they also supplied the steel for the World Trade Center in New York. They build a lot of bridges as well. The tower was a completely new design from the ground up. You start with what your loads are going to be and do your calculations from there.

Is this tower a joint venture among the participating stations, in any way?

This is not a joint venture. Gannett Tower Company, a division of Guy Gannett Broadcasting, owns the site outright and leases space to the other stations. The prime objective in building the tower was to give an improved signal to our own FM station in Miami.

What factors go into making an ideal FM transmission?

FM and TV are identical. Multipath on FM sounds like picket-fencing, and on TV causes ghosts. Any tall or reflective structures around the antenna will create these effects. In downtown Miami, buildings going up created a multipath problem for all of us who were located there. We looked for a tower location that had no tall structures around it, in an area where there would be no more tall buildings going up because there is no more available land.

How important was the location itself?

We selected an area that is centrally located. The tower is 13.1 miles from downtown Fort Lauderdale and 13.1 miles from downtown Miami. We are also in the center of the South Florida population.

You try to put a signal high enough so that it will drop down on the various areas. It is like an air-conditioning unit with the cool air coming in on top of you, or like an umbrella of sound. FM and TV are like fight. They need a clear shot to something, without interference from structures which will degrade the signal.

What makes this tower different from others that previously existed?

We wrote a set of specs on this system that have never been met before. They have never been approached. The entire nation is watching, and other places such as St. Louis, Memphis, and Washington, D.C. will be doing similar projects.

We have a combined antenna, and every FM station using it has the same height, about 1,010 feet. The TV station is below the FMs because a TV station can actually get extra gain from using the tower face itself to direct the pattern. There are two sets of antennas and two feeds to it from the combining room down at the bottom. It is a redundant system; should we have any problem, we can switch to the upper or lower half of the antenna or the transmission line. All the FMs come out of the same mass of steel at the top of the tower, which looks like a bunch of airboat fans. The bays are eight-foot baskets up there. Instead of putting the same number of bays on each side of the tower, we have more to the north and south than to the east and west, to concentrate the signal where the population is. There's no sense in broadcasting to the Everglades and the ocean.

Is this a unique way to load an antenna array?

This is a new technique, but it is actually a channel-6 TV antenna tuned to the FM band. It is a broad-band antenna which

covers the entire FM band, so anyone with an FM station can come plug into it if we have space. We tested on virtually every frequency in South Florida, so that anybody who wanted to come up later could do so.

Who developed the technology to operate this combined system?

It has been played with for a long time. As a matter of fact, our old antenna at One Biscayne had three stations on one antenna, but it didn't work as well as this one does. Shared antennas are beginning to pop up in other places. This is a very efficient use of air space, buildings, land, and technology. It is the wave of the future.

How does the combiner work?

It is a series of cascaded modules, each of which adds a narrow-band signal from a single transmitter into a broad-band mix of frequencies from all the transmitters which have gone before it in the system. The bandwidth of the signal mixture increases at each step, but the transmission line doesn't know what frequencies it's carrying—it doesn't really care. The broadest-band port on the system is the input to the antenna; the antenna itself is tuned to cover the entire FM band, from 88 to roughly 108 MHz, and it just passes what it is given.

Each station's input is split in two, and each half is fed through cavity-resonator filters. The filters allow the signal to go only in one direction. They also shape and configure the signal to transmit only within its designated bandwidth. In our situation we are allowing ±200 kHz. Everything beyond 200 kHz is attenuated rapidly, and everything within the ±200 kHz is flat. The specs call for the signals to be within 0.5 dB, but in fact they are within 0.3 dB. This means that you have the purest possible signal.

It is like a baker putting his bread ingredients in a pan and then in the oven. The cavities are the pan that shapes it, and the combiner would be the oven that makes the whole thing come out. The antenna transmits exactly what its combiner shapes the signals to be. The combiner is taking the spectrum and allowing only certain things to pass through. It rejects all multiples or harmonics or spurs from each of the stations. None of the stations can mix within the antenna. They can't generate any spurious transmissions.

How does your combiner differ from other combiners?

There have been a lot of attempts at combiners, but this is the most successful to date. It has exceeded specs which themselves were superior to anything ever done before. Some of the major suppliers of equipment told us we were dreaming when we wrote the specs. The problem with combined systems in the past was that they had such narrow r.f. bandwidth that there was crosstalk between the stations, stereo separation was reduced, and fidelity was questionable, especially at high frequencies.

That sounds like a fat man in an airline coach seat.

I guess that is true with the old combiners. A fat man in a small seat is a good analogy for it: The transmitter is putting out a lot more than the combiner can pass.

Who built your combiner?

Shively Labs in Bridgeton, Maine. They were the only ones who said they could meet our specs. All the other companies said they couldn't do it. Our radiating baskets were made by Harris Corporation in Quincy, Illinois.

How do the individual FM stations feed their programming to you?

Everybody is using microwave transmission from the studio to the antenna.

Will this allow every station to deliver signals from 50 Hz to 30 kHz?

Actually, everyone will go virtually from d.c. to 200 kHz. That is unique. It means that there will be enough bandwidth for subcarriers such as Muzak, paging services, and slow-scan TV to propagate their information without interfering with the stations. We can feed virtually anything in there within our occupied bandwidth. The rules right now allow stations to occupy ±150 kHz, and we have taken our system's capabilities out to ±200 kHz just to make sure we will be able to handle anything that comes out in the future. We are not transmitting that at present, but we can. This is the most unique thing about this whole system. It can't even be done today by most standard FM stations—and this is a *combined* FM station, and it can be done here.

WINZ can put out a signal anywhere within ±200 kHz of center frequency with no problems. That's the key to good stereo separation.

Most of the broadcasting hierarchy doesn't appreciate this, but they will in the future when we start utilizing the spectrum better and they can start doing things they don't believe they will be able to do, without any chance of crosstalking into their FM stations.

I understand that this system also greatly improves stereo separation.

Absolutely. This again comes back to occupied bandwidth. You have got to have the bandwidth before you can have stereo separation, and you also need flat frequency response. This doesn't mean the 20 Hz to 20 kHz that you can hear. The frequency response I am referring to is, again, occupied bandwidth.

We can put a signal out anywhere within ±200 kHz from the channel's center frequency without creating any problems with the signal. That is the key to stereo separation. The best generator we could find for stereo separation was a QEI stereo generator whose specs indicated 52 dB of separation, and that is what we measured. We don't know what the system can really do, because the best piece of equipment we can find goes only so far—and we match that performance.

Will your new tower change the modulation game in the Miami area?

I don't believe that South Florida is that hot on modulation games. Stations are more concerned with their quality than with compression. The thing that people have to remember is that the louder a station goes, the more it has to give up to get louder. If you jam it up to get louder, you are limiting your dynamic range.

One of the reasons stations play modulation games is to try to attract people who are turning the dial. However, many stations are trying to make up for a weaker signal. Multipath problems can be concealed by modulation because the picket-fencing is covered up by the louder sound. Some of the downtown stations used modulation for this purpose, but this is no longer necessary. Modulation also covers up noise.

The first night I listened to our station on this system, as I was driving home, the thing that impressed me the most was not stereo separation and it was not loudness. I actually heard a dust piece in the groove of a record. I can't tell you the last time I heard that on a radio station. *This* is stereo quieting! I was also impressed with our mono signal. The commercials were clear and precise, and the disc jockey sounded like he was right in the car with me. The whole thing was more dynamic. That is the best word to describe it.

Don't you tend to hear picket-fencing more in a car?

You can hear picket-fencing only in a car because you go in and out of pockets of reception that are caused by reflections from other sources. If you are sitting still, you will either have the signal or you won't.

You started with five FM stations and have been adding more ever since. Does each maintain its own transmitter?

Each station maintains its own. Every station can select its own transmitter and exciter, as long as they meet certain standards which are necessary for the combined system.

Is the exciter what gives you your stereo separation?

The exciter is the actual transmitter. It is usually up to 50 watts, although many are run at about 10 watts, and it measures no more than about 7 × 19 × 15 inches. All that follows it is a bunch of amplifiers that increase the signal power.

Is there much maintenance involved with this system?

Everybody has a system that will pretty much take care of itself. Each transmitter has its own room and closed-loop air system, so the transmitter keeps re-breathing its own clean, cool, dry air over and over again. Every station controls its own signal as well.

Is your signal so good that it points out flaws in the equipment the stations on the tower are using?

Gosh, I hope so. I think it should. Especially since many are using Compact Discs for the dynamic range and lower noise.

In downtown Miami, other buildings created multipath problems, so WINZ looked for a site where no more tall buildings would go up.

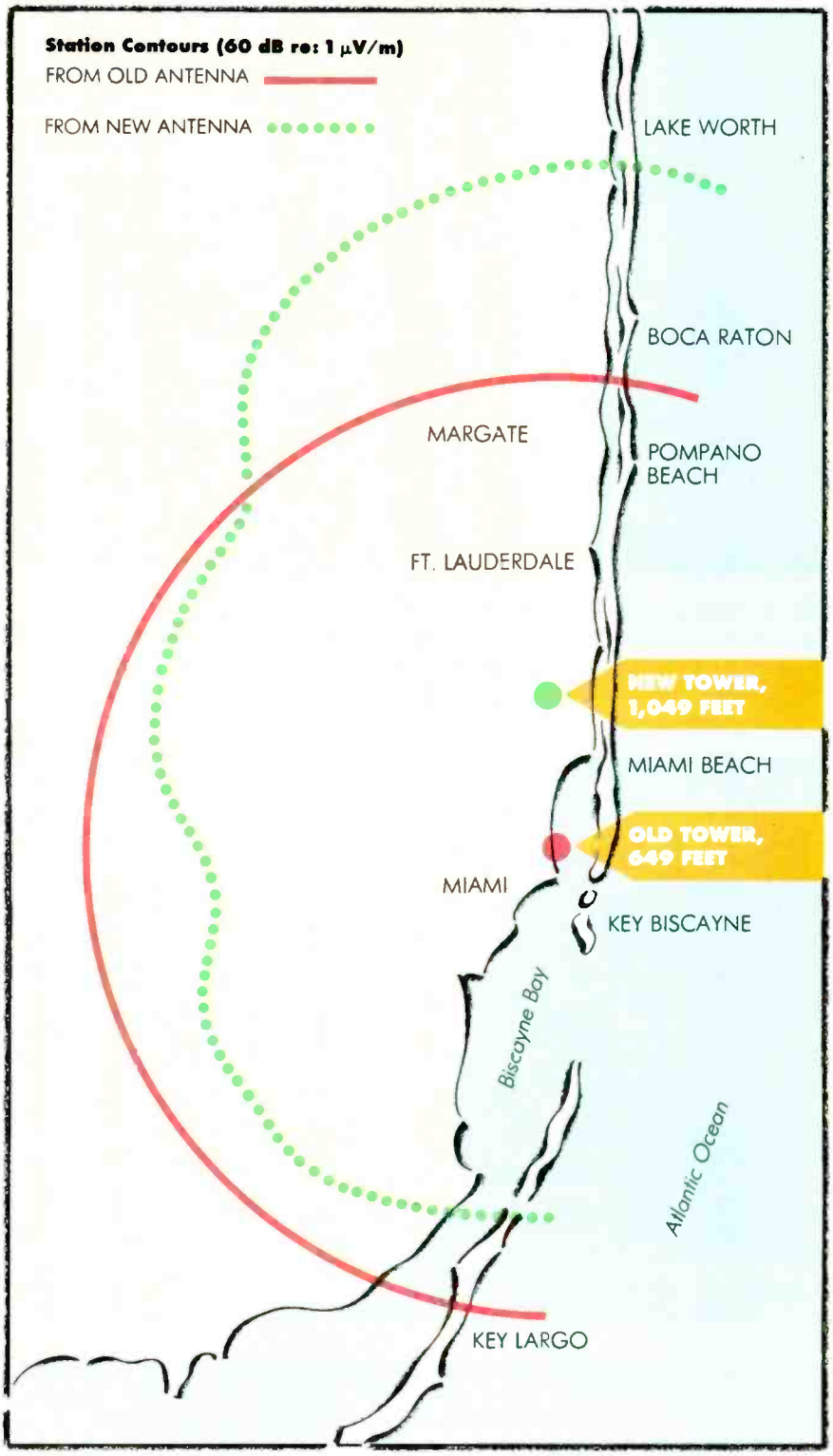
the line. The new combination is then fed out, via the lower patches, to the next station's broad-band port.

The Filter Section

The filter sections each have three parts, an input hybrid, a cavity module, and an output hybrid. A hybrid, in broadcast terms, is a four-port power divider. Power fed into any port of the hybrid is split evenly between two other ports; no power flows into the remaining port. The hybrids used in the Miami installation are a quadrature type, meaning that the two outputs differ in phase by 90°.

There is a 50-ohm "dummy" or "reject" load on the fourth port of the input hybrid, necessary to keep the hybrid's impedance balanced. In a perfect hybrid, no power would reach this load resistance, but in the real world, some does both from the module's own transmitter and from other transmitters in the combiner system. Typically, the power from each transmitter on the system is not that much; for 20-kilowatt transmitters, it should be about 10 to 20 watts from the module's own transmitter, plus a few watts from each of the system's other transmitters. The resistors used in the combiner have rated capacities that range from 100 to 1,000 watts, while the antenna reject load resistors are rated at 5 kilowatts. All are cooled by oil baths. Their temperature is monitored by an electronic system that sounds an alarm and shuts off that module's transmitter if there is an abnormally high level of power dissipation across them.

The cavity modules are where the filtration takes place. The "cavities" are actually resonators formed of quarter-wave sections of 75-ohm coaxial cable, one end shorted and the other open-circuited—equivalent to such



From its new antenna site, WINZ-FM's signal covers about 5.5% more area, and reaches nearly 8% more people, than it did from downtown Miami.

Since moving to the tower, classical station WTMI has improved its audio quality by replacing telephone program links with a microwave relay dish (left) and a satellite link to the Mutual Broadcasting Company's Metropolitan Opera feed (right).

Downtown Miami, showing former WTMI antenna (building at left) and antenna formerly shared by WINZ, WLVE, and WHQT (building near center). Signal reflections from surrounding buildings caused multipath distortion and dead spots.

When stations are only 0.8 MHz apart, the combiner must have extra filters to prevent their interfering with each other.

acoustic cavity resonators as closed organ pipes, soda bottles, and vented speaker enclosures. A temperature-compensation system keeps the length and tuning of each resonator constant regardless of changes in temperature.

There are eight such cavities per combiner module, divided into two parallel paths. The input hybrid divides its input power equally between the two parallel paths and creates a phase difference of 90° between the two. The output hybrid recombines the two halves of the signal, putting them back in phase with one another at the terminal which leads to the next transmitter module on the string, and cancelling any signals which might otherwise feed back through the output port to the previous transmitter module. This process transfers nearly all of the transmitter's power into its broad-band line, which eventually feeds the combined signal into the antenna.

The broad-band line conducts the first station's signal to the broad-band input of the second station's output hybrid, which splits that signal and feeds it to the second station's two filter modules (Fig. 2). Because these modules are tuned to pass only the frequency o the station operating through them, the power from the broad-band line reflects off the two filter sections back into the output hybrid. This reflected broad-band power recombines in tha hybrid and is transferred back into the broad-band line towards the antenna. Meanwhile, the second station's power is fed through its combiner module into the broad-band line, exactly as the first station's power was fed by its module. In the broad-band line, we now have the power from two stations travelling toward the antenna, each unaffected

by the other. The same operations are repeated for all the other modules in the combiner system.

This quadrature technique allows the cavity modules to be smaller and more efficient, because each filter section handles only half its transmitter's power. According to Richard L. Edwards, chief engineer of Guy Gannett Broadcasting (which owns WINZ and the antenna tower facility), if the transmitter's entire output were fed through a series string of combiners, "the cavity resonators would be enormous, hot, and higher in insertion loss."

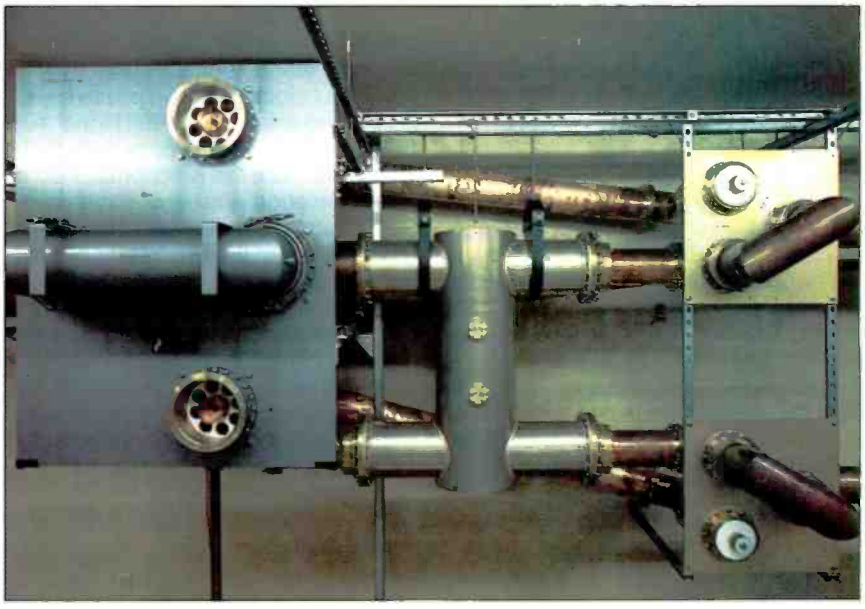
The two resonators are each tuned to their station's center frequency. This technique reduces losses, not only making the system more efficient but keeping the resonators more sharply tuned.

Even this filtration is not enough for stations that are very closely spaced, such as WLVE and WTMI (93.9 and 93.1 MHz) and WSHE and WMXJ (103.5 and 102.7 MHz). These stations are as close as the FCC allows in a given market, with carriers 0.8 MHz apart and sidebands extending to within 0.4 MHz of each other. It is very difficult to make filters which have the bandwidth and phase linearity to pass the desired station without distortion and which also provide sufficient isolation from closely spaced signals.

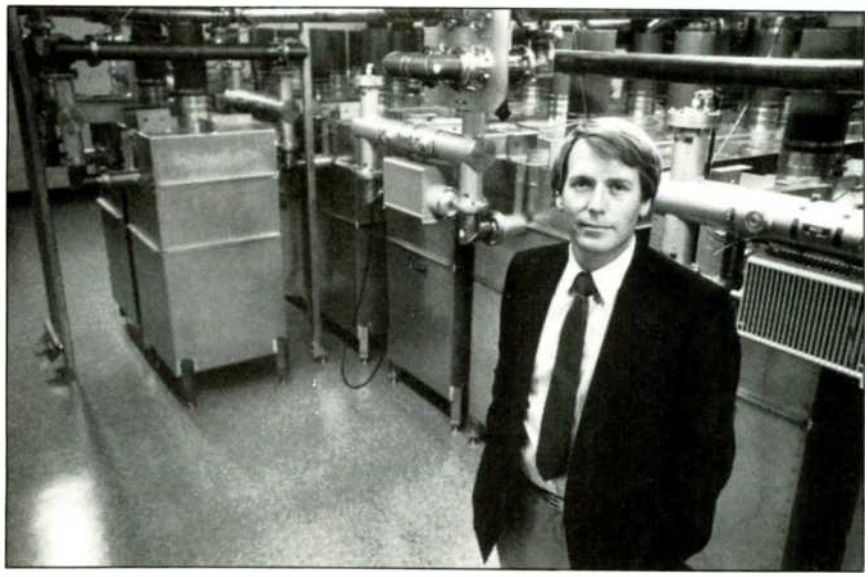
The hardest problem to control is the group-delay difference mentioned earlier. The group-delay curve of the band-pass filter sections is a parabola, symmetrical around its center frequency. When two transmitter modules' frequencies are close, their curves become lopsided, greatly increasing the group-delay difference across each station's channel.

The solution to this problem is to provide "equalizers"—filter cavities tuned to cancel these group-delay effects (shown in Fig. 1 between the input patch panels and input hybrids for WLVE and WMXJ). If the filter modules were simply connected in parallel, equalizers would be needed for the combiner modules of both stations in each closely spaced pair. In the balanced combiner used in Miami, however, the output hybrid of the "downstream" channel (the one nearer the antenna) isolates that channel from group-delay effects caused by the

The combiner room of the tower in 1985, when only five FM stations and one TV station were broadcasting from there. The "pipes" are large-diameter coaxial cables.



The combined signals of all the FM stations on the tower flow through the patch panel at left into the hybrid at center. This hybrid divides the signal in two, sending each half, via one of the patch panels at right, to a separate half of the antenna. If one part of the antenna fails, the other can continue operating.



Richard L. Edwards, director of engineering for Guy Gannett Broadcasting, in the new combiner room.

The system's specifications were stringent, but when it first went on the air it surpassed most of them by wide margins.

"upstream" channel, so only the latter requires equalization.

Each equalization module, placed at the input of the upstream channel's combiner module, consists of an extra hybrid and two equalizer cavities. These cavities are tuned to reflect the channel's power back into the equalizer hybrid. As they do so, they "predistort" the signal's group-delay characteristics to compensate for the group-delay distortion that will occur when the signal reaches the downstream module of the closely spaced station pair. As a result, the distortion is cancelled before it can go down the line towards the antenna.

The Antenna Section

After the last transmitter's output has been combined with that of all the others, the signal passes through another patch panel to a final hybrid. The hybrid divides the signal into two portions, each feeding a different half of the antenna. This redundancy allows the stations to stay on the air (albeit with reduced power) should storm damage or other problems affect either half of the antenna. Because the hybrid's two output signals differ in phase by 90°, the leading-phase half of the signal must be delayed to let the other half of the signal catch up; this is accomplished by placing enough additional cable to delay the signal 90° between the leading-phase output of the hybrid and its associated antenna half. The band separation filters allow each station's output to the antenna to be monitored from the system's control console.

Note that the antenna section also contains patch panels. These allow the entire signal to be fed to either half of the antenna, should the other half malfunction.

Performance

The Miami combiner more than fulfills most of its design objectives. "We get 80 dB of isolation between stations," Edwards says. "In the past, the rule of thumb was 28 dB. Further, nothing on either side of the signal will pass that can interfere with other stations. Yet the waveforms are perfectly contoured within ±200 kHz of the main signal. We're flat within 0.3 dB, which means stereo separation will be better than on other systems—better than most single-station systems. Everything we've tested so far exceeds the limits of our measuring equipment."

The original specifications worked out between the combiner's maker, the Shively division of Howell Laboratories, and its purchaser, Guy Gannett Broadcasting, called for a VSWR (voltage standing-wave ratio, a measure of impedance matching and power transfer between transmitter and antenna) of at least 1.1 to 1 over a range of ±150 kHz around each station's frequency. Frequency response was specified to be flat within 0.5 dB or less over a range of ±200 kHz around each station frequency. Isolation between stations was to be 50 dB or greater at a channel spacing of 0.8 MHz. Insertion loss was to be no more than 0.3 dB per module, and group-delay differences within ±150 kHz of each station frequency were to be kept within 50 nS or less.

When the system went on the air in 1985, with just five stations, most of those specifications were either met or exceeded by a wide margin. The combiner's VSWR was within limits over the specified ±150 kHz range for one station, and within ±300 to 400 kHz for all the rest. Frequency response was flat within 0.1 to 0.2 dB, except for a 0.5-dB response drop at −200 kHz for one station that was closely spaced to another. Isolation between that pair of stations was 59 dB in one direction and 66 dB in the other; it ranged from 64 to 98 dB between all other stations. Insertion loss was not quite up to spec, ranging from 0.31 to 0.64 dB, but it was below 0.4 dB for all modules but one. Group-delay differences ranged from the specified 50 nS down to a low of 30 nS.

"We pushed them pretty hard on the insertion loss," says Edwards, "but it's still acceptable—and most of the other specifications are surpassed by a wide margin. There are systems still on the drawing board that don't do this well.

"What does this mean to the listener? It means that whatever's being played in the studio, even a CD, is guaranteed to pass right through the system to the listener's receiver, with no audible degradation."

THE DELICATE BALANCE

POLARIS. The promise of delicate tube-like performance is part of the allure of MOSFET amplifiers. But the promise remained largely unfulfilled, until now, because of transconductance error. In Polaris, Sumo employs proprietary active bias output circuitry to correct the problem. Dedicated servo circuitry also reduces crossover notch distortion to levels found in the very best Class A amplifiers. And the elimination of protection circuitry ensures the purest possible reproduction of music.

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1

THRESHOLD SA/1 AMPLIFIER

Manufacturer's Specifications

Power Output: 160 watts continuous into 8-ohm loads, 20 Hz to 20 kHz.
THD: Less than 0.1%.
Frequency Response: 7 Hz to 100 kHz, for −3 dB points.
Slew Rate: 50 V/μS.
Output Current Capability: 40 amperes continuous, 60 amperes peak.
Input Impedance: Less than 0.03 ohm, 20 Hz to 20 kHz.
Gain: 26.6 dB.
S/N Ratio: 100 dB, unweighted, re: rated output.
Load Rating: Operation permitted into any load, limited only by power-supply fuses and thermal protection.

Dimensions: 19 in. W × 9.65 in. H (including feet) × 17.25 in. D (48.3 cm × 24.5 cm × 43.8 cm); faceplate, 8.75 in. H.
Weight: 78.5 lbs. (35.6 kg).
Price: $3,750.
Company Address: 1945 Industrial Rd., Auburn, Cal. 95603.
For literature, circle No. 90

Photograph: Jay Brenner

To justify a price of $3,750 for a monophonic power amplifier (or even a stereo one), the company brave enough to offer such a product must offer a truly unique design. Nor is innovative design enough: To convince even the most affluent of audiophiles to spend $7,500 for a pair, such an amplifier had better be audibly very superior to the competition. In their SA/1 amplifier, Threshold has, in fact, brought their "Stasis" concept to its ultimate realization. The overall design is brilliant, and the sound quality is so transparent and clear that few superlatives exist to do it justice. All of this does not explain why Threshold needs to ask so staggering a price for the SA/1. The explanation has to do with the difference between a true Class-A design (which the SA/1 is) and the myriad pseudo-Class-A designs which have appeared during the last few years. The latter purport to provide all the benefits of Class A without the most obvious disadvantage: The high currents drawn even when no signal is applied. Most true Class-A, solid-state designs which I have evaluated in the past could boast no more than a 20 to 30-watt power rating because of the continuous current requirement. The SA/1 is conservatively rated at 160 watts continuous power output. To reach this power level, Threshold uses no fewer than *40* output transistors (20 NPN-PNP pairs in what looks, at first, like a conventional complementary-symmetry output-stage configuration. Upon closer examination, though, you will discover that the output stage is anything but conventional.

Stasis Technology

Figure 1 is a much-simplified diagram of the Stasis principle. Threshold provides a very clear explanation of just how it works in the SA/1 amplifier (and others in the Stasis series), and how this amp is different from any other. Since the manufacturer does a better job of explaining the circuit than I could myself, some of that explanation follows:

"The output stage of a Stasis amplifier is so accurate in its operation that no corrective (feedback) loop needs to be employed around the amplifier system to impose 'compensating' inverse inaccuracies.

"Threshold Stasis amplifiers do not attempt to fool a nonlinear system into exhibiting linear results through imposition of a corrective distortion loop around the amplifier system. Instead, they are able to maintain the transistors themselves under such unvarying conditions of voltage and current that their gain characteristics become virtually perfect so that no corrections are required.

"The Stasis operating principle is based upon a simple and incontrovertible fact: The current through a load is determined by the voltage across it. If the voltage across the load is free of distortion, the current will be distortion-free too and so will the power delivered. Threshold Stasis amplifiers embody a patented binary output stage in which an extremely linear voltage amplifier, operated in pure Class A, determines signal accuracy by supplying the voltage across the load. The voltage amplifier is connected *directly* to the load and to a powerful current mirror which is also connected to the load and to the voltage amplifier. It is the current mirror's 'bootstrap' that supplies the current—or power—through the load.

"As the voltage amplifier has to do no amplification 'work,' its gain transistors can be held in a stasis—or virtually unchanging—condition relative to voltage and current. Without being subjected to fluctuating voltage and current, the devices of the Stasis section maintain a uniform gain factor and, by definition, linearity and freedom from distortion. Because the output impedance of the Stasis section voltage amplifier is very low relative to the output impedance of the current bootstrap, it is able to dominate the performance of the tandem system. In this way, the accuracy of the amplifier is that of the extremely linear and precise Stasis section."

Additional Circuitry

The input stage of the SA/1 consists of four matched N-channel J-FETs. One pair is arranged as a matched differential input pair which is operated at a constant voltage through cascode shielding by the second pair. Secondary cascoding is also employed, so that the regulation associated with the cascode operation is applied to the input J-FETs twice. This results in better isolation of the audio-signal circuits from power-supply dynamics and signal-induced voltage variations. The extremely high active impedance of the input J-FETs, along with their high linearity and low transconductance, offers a variety of benefits. These include reduced interaction with the signal source, greater power-supply rejection ratio, and the need for only a very minimal amount of local feedback.

The output stage of the SA/1 employs fast power transistors, each rated at 200 V, 20 amperes. This results in a greatly extended safe area of operation; output transistors are used at a small fraction of their power capabilities.

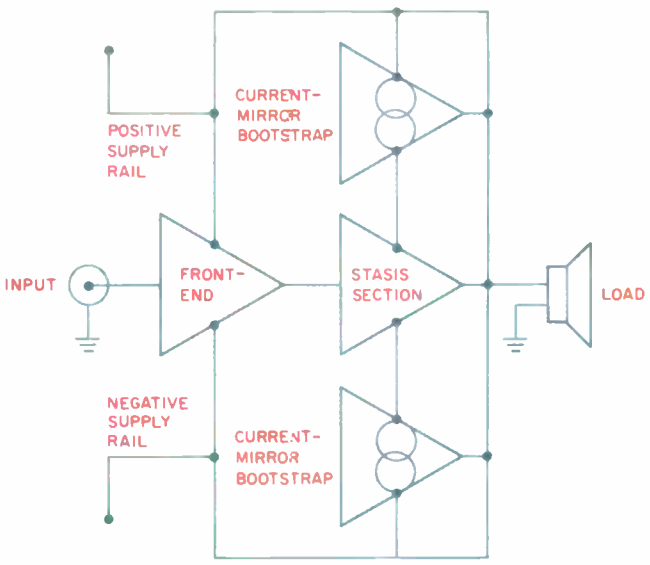

Fig. 1—Simplified block diagram of Stasis circuitry.

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Pioneer's Revolutionary CD/LaserVision Player

If there was ever a machine ahead of its time, it's Pioneer's new CLD-909. The most remarkable machine ever invented to play compact discs, LaserVision discs and music video discs.

No longer need you buy two machines to get the best of both sight and sound. The CLD-909 does it all. And does it beautifully.

The CLD-909 represents a stretch of the engineer's imagination. It incorporates a number of technological breakthroughs. One is a laser pickup/objective lens system with the smallest aperture yet—0.55 microns. That's one thirty-four hundredths the diameter of a human hair. It takes this kind of incredibly fine laser focus to read the density of information encoded on CDs and LaserVision discs. Another is a newly-developed Constant Distance Tilt Servo that maintains high trackability even on severely warped discs.

It is this kind of advanced technology that lets the CLD-909 deliver a picture 20% sharper than live broadcast television. And 60% sharper than the latest VHS HQ VCRs.

Getting the picture? It's so sharp and accurate and faithful to life that things appear almost 3-dimensional. And unlike videotapes, optical discs don't wear out. They also give you random, immediate access to any frame or time point. Impossible with tape.

And what convenience and versatility. You can program the CLD-909 to play audio or video tracks in any order you wish. You can repeat programs, segments, or entire sides. The possibilities are just about endless.

The CLD-909 includes many highly sophisticated features. Like automatic disc and digital sound detection, semi-automatic front loading, subcode output, on-screen programming, as well as on-screen function display. It is fully remote-controllable for stand-alone or system use, and has a built-in computer control port. We've also designed a new CD Motor *Swing Assembly* that lets us make the CLD-909 just 4.7 inches high. Then we added sophisticated electronics like a new Pulse Count IC and Noise Canceller to achieve a remarkable horizontal resolution of 400 lines.

The CLD-909 gives you breathtaking digital audio to match its breathtaking video. From compact discs, of course, as well as many 12-inch LaserVision discs and 8-inch music video discs. And Pioneer's exclusive Linear Servo system accurately reproduces music from even warped, scratched or dirty CDs.

Pioneer's revolutionary CLD-909. More than just a new idea. It is without a doubt the finest source of sight and sound you can possibly own. See it at your Pioneer Dealer. Or call 1-800-421-1404.

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To reach its rated power level of 160 watts, the SA/1 uses no fewer than *forty* output transistors in a configuration that is anything but conventional.

Another benefit of this conservative design is that it is not necessary to use active and often audible protection mechanisms to safeguard the output stage or to introduce any fusing between the output transistors and the loudspeaker load.

Eliminating this fuse lowers the source impedance of the output stage, thereby increasing the amplifier's damping factor. In conventional designs, high damping factors are directly related to the use of large amounts of overall loop feedback. What is often overlooked in such designs is the fact that at high frequencies, feedback is often reduced to very low amounts because of the need to maintain amplifier stability. The result: Lower damping factors at high frequencies. Threshold maintains that high damping factors are needed even at high frequencies, where, for example, an electrostatic loudspeaker's impedance may drop to 1 or even 0.5 ohm. A damping factor of only 10 at those frequencies would mean the amplifier's impedance would be 0.8 ohm, low enough to cause a power loss of more than 3 dB into the electrostatic's ultra-low load impedance. A high damping factor at higher frequencies will even benefit cone loudspeakers, as it results in lower distortion and improved transient response. Since the SA/1 does not derive its high damping factor from feedback and does not use an isolation inductor at the output, a high damping-factor value is maintained across the entire audio frequency band.

The SA/1 employs a huge, toroidally-wound power transformer. Its output is fed to 35-ampere rectifying diodes and is smoothed to d.c. by electrolytic capacitors totaling 120,000 µF of capacitance. (One could almost start expressing that much capacitance in farads, i.e., 0.12 F!) The supply voltage undergoes additional filtering before reaching the actual audio circuits. A combination of electrolytic and high-value film capacitors is used for this purpose.

Physical Description

Gold-plated, machined, Teflon-insulated input connectors are used in the SA/1. High-current, five-way binding posts have contact surfaces that are also gold-plated. Circuit boards are made of military-grade glass-epoxy with paths plated in gold over nickel. All internal connections are hand soldered. I found metal-film and wire-wound resistors throughout, along with film and silver-mica capacitors in the actual signal-path circuitry.

A large, well-calibrated peak-reading meter dominates the elegant front panel of the SA/1. The only control is the on/off rocker switch, which is, in reality, a high-capacity circuit breaker. Input and output terminals, as well as line and "+" and "−" B-supply fuses, are accessed from the

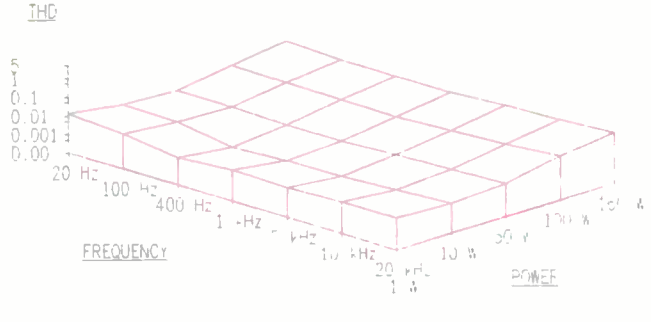

Fig. 2—THD vs. power and frequency, 8-ohm load. THD scale is logarithmic.

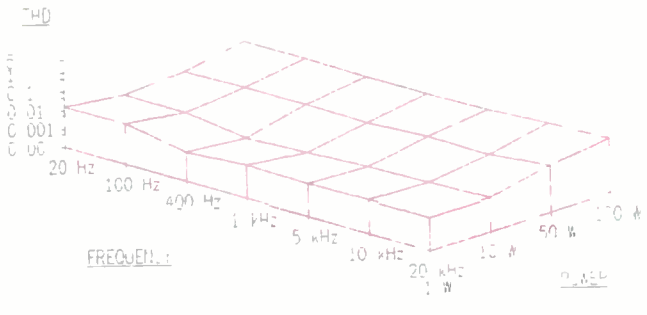

Fig. 3—Same as Fig. 2, with 4-ohm load.

Just a few measurements confirm the fact that a good-sounding amp like this one will measure well too. We all know the reverse isn't always true!

rear panel. Dual banana plugs are supplied for wiring up speaker cables so that they can be easily plugged into the amplifier's five-way output terminals. Spare fuses are also included with each SA/1.

Measurements

It took only a few measurements on my part to confirm the fact that this amp, which had sounded so good in the earlier listening tests, measured well, too. (The reverse, as we all know, is not always true!) At mid-frequencies, the SA/1 delivered 190 watts of continuous power into 8-ohm loads for its rated THD value of 0.1%. It did almost as well at the audio frequency extremes, where just over 180 watts resulted in a THD reading of 0.1%.

I've always had problems measuring THD for power amps at very low output levels. When you get down to 1 watt or so, residual noise and hum start entering into the distortion measurement. Since I don't like to doctor these measurements with band-pass filters, which often obscure other problems, I end up having to use a spectrum analyzer to isolate the actual THD from the hum and noise. Even at that, unless the analyzer has a very wide dynamic range, it's not always possible to isolate an accurate THD reading from the rest of the unwanted components that show up on the analyzer's screen. All of this is by way of telling you that the Threshold SA/1 yielded a THD reading of only 0.005% at 1 watt output into 8 ohms *without* my having to resort to filters of any kind or to interpret results on a spectrum analyzer. My good old distortion analyzer managed to read this low figure all by itself! In fact, at 10 watts output, the THD sank even lower—down to an incredibly low 0.0015%! When I pushed the amplifier up to its rated output of 160 watts, THD rose to 0.02% at mid frequencies and 0.025% at 20 Hz. Threshold's 0.1% rating was evidently intended to take care of the slight rise in THD that did occur at the high-frequency end of the spectrum. Still, at 20 kHz, I read only 0.06% THD, and the 0.1% level was not reached until the amp was delivering 182 watts at 20 Hz, 190 watts at 1 kHz, and 180 watts at 20 kHz. SMPTE-IM distortion measured exactly 0.1% at rated output but was only 0.01% at 100 watts output. As for CCIF-IM or IHF-IM distortion, if there was any in this amplifier it was too low for my test instruments or spectrum analyzer to detect. A "three-dimensional" diagram, Fig. 2, illustrates how THD varied with power output and frequency.

I made a complete set of measurements using 4-ohm loads as well even though Threshold does not provide an official power rating for this impedance. Into such a load, the amplifier delivered a power output of 335 watts at 1 kHz and 324 watts at 20 Hz for a THD of 0.1%. The test conditions for Fig. 3 were similar to those for Fig. 2, except that the load impedance was 4 ohms instead of 8.

Although I did perform some measurements of power output at 2 ohms, it soon became clear that if I tried to push the amplifier to its limits with that type of load, I would blow its fuses. Most likely, I would also exceed the current capacity of the voltage regulator which I normally use to maintain a steady line voltage of 120 V when making such critical measurements. Accordingly, for data involving 2-ohm loads I'm going to rely upon curves supplied by Nelson Pass, the well-known designer and president of Threshold. I'm told not only that Mr. Pass was responsible for this superb amplifier design but that he personally supervises its production and makes certain that each unit leaving the factory measures up to his standards. I think it's safe to accept his curves as being correct, and so they are included here as Fig. 4. His measurements show that even when driving a 2-ohm load, this remarkable amplifier delivers around 600 watts at mid-frequencies, and over 500 watts at 20 kHz, for a THD level of around 0.15%. I don't know of many other power amplifiers at any price that can boast this power output with such a low-impedance load presented to them.

Amplifier gain of my particular sample was a bit higher than the 26.6 dB claimed; I measured it to be 29.5 dB from input to output, referring again to an 8-ohm load. Frequency response was off by 1.0 dB at 14 Hz and 55 kHz, while the −3 dB points occurred at 7 Hz and 100 kHz, exactly as claimed. Damping factor measured exactly 500 at 50 Hz. In fact, it was probably a bit higher, since I did have to use a couple of feet of Monster Cable between the output terminals and the measuring instruments, and this added a tiny

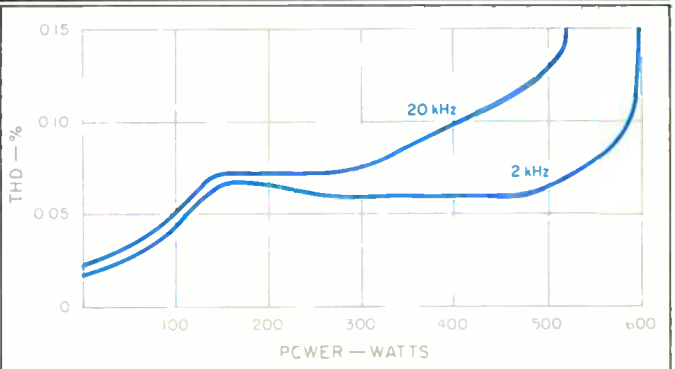

Fig. 4—THD vs. power at 2 and 20 kHz, 2-ohm load. Data was supplied by manufacturer; see text.

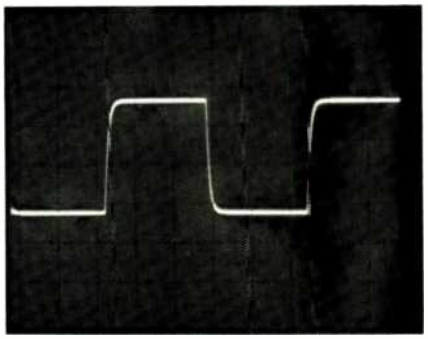

Fig. 5—Response to 20-kHz square wave at 80 watts into 8 ohms.

"State of the art" is a bit shopworn, but there's no other succinct phrase to describe the utterly clean, open sound of this amp.

fraction of an ohm to the "looking back" impedance of the amplifier. Signal-to-noise ratio, referred to 1 watt output, measured 90 dB. (No wonder hum and noise did not affect the THD readings at low power output levels.) Translating this to an S/N value below rated output (the way Threshold quotes S/N), I come up with a figure of 112 dB. Incidentally, all of these measurements are unweighted, since that's the way Threshold quotes their noise figure. If I were to add an A-weighting network (the standard method approved in the EIA Amplifier Measurement Methods Standard), the S/N figure would be even higher.

The SA/1 was not designed to provide much dynamic headroom above its continuous rated power level; I measured 0.6 dB. However, I have never regarded dynamic headroom as a measure of quality. It's nice to have lots of it if you're playing music that has a wide dynamic range through a low-power amplifier into speakers of fairly low efficiency. When you start out with an amplifier that can deliver as much *continuous* power as this one does, extra dynamic headroom becomes rather academic!

To illustrate the superb rise-time and slew rate of this amplifier, I fed a 20-kHz square wave into it. The resulting output, at half rated power into 8 ohms, is shown in Fig. 5, and like everything else about this unit, it is outstanding. I've seen 1-kHz square waves from some amplifiers that don't look this good!

Use and Listening Tests

Most of the bench measurements were made on a single sample of the SA/1; I then set up two samples for extended listening tests, which have been going on for more than a week as I write this. I'll be sorry to part with these amplifiers—and not just because it's going to be difficult to lift them back into their cartons. I know that the phrase "state of the art" has become a bit shopworn, but there's no other succinct way I can describe the utterly clean, open sound of the SA/1. Not having a variety of speaker loads with which to try it out, I queried some of my dealer friends who have had experience with the Stasis series of amps, including this one; they tell me they have yet to encounter an unusual speaker load that would present problems.

Do I have any negative comments to offer? Yes, just one: It's too bad an amplifier that performs this well must cost as much as it does. The high price of this audio masterpiece necessarily limits the number of people who can actually own and enjoy it. And, of course, if you do own a pair, you've got to be prepared to run up your electricity bill somewhat, as each unit does draw around 3 amperes from the line *at all times*. That's one of the penalties you pay for Class-A operation. On the other hand, if you have enough money to buy a pair of Threshold SA/1 amplifiers, the few cents a day extra that you'll be giving to your utility company is not likely to bother you at all. *Leonard Feldman*

.....remarkable!

par.a.digm (par'adim) *noun: serving as an example or model of how something should be done.*

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2

NAKAMICHI SR-3A RECEIVER

Manufacturer's Specifications

FM Tuner Section

Usable Sensitivity: Mono, 11.0 dBf.
50-dB Quieting Sensitivity: Mono, 14.7 dBf; stereo, 37.5 dBf.
S/N Ratio: Mono, 79 dB; stereo, 74 dB.
THD at 1 kHz: Mono, 0.05%; stereo, 0.07%.
Capture Ratio: 2.0 dB.
Frequency Response: 20 Hz to 15 kHz, ±1.0 dB.
Muting Threshold: 30 dBf.
Alternate-Channel Selectivity: 55 dB.
Image Rejection: 75 dB.
I.f. Rejection: 80 dB.
Spurious-Response Rejection: 90 dB.
AM Suppression: 60 dB.
Separation: 50 dB at 1 kHz, 46 dB at 100 Hz, 46 dB at 10 kHz.

AM Tuner Section

Sensitivity: 53 dBμ/m (dB referred to 1 μV/m).
S/N Ratio: 52 dB at 90 dBμ/m.
THD: 0.3% at 90 dBμ/m.
Selectivity: 20 dB.

Amplifier Section

Power Output: 45 watts per channel, 8-ohm loads, 20 Hz to 20 kHz.
THD: 0.1%.
IM Distortion: 0.15%.
Dynamic Headroom: 1.5 dB.
Headphone Output: 105 mW (40 ohms).
Peak Output Current Capability: 18 amperes per channel.
Input Sensitivity: MM phono, 0.37 mV; MC phono, 8.9 μV at 32-dB gain, 24.0 μV at 24-dB gain; high level, 30 mV.
Phono Overload: MM, 140 mV; MC, 3.0 mV at 32-dB gain, 8.0 mV at 24-dB gain.
Phono S/N Ratio: MM, 80 dB; MC, 73 dB at 32-dB gain, 72 dB at 24-dB gain.
Tone-Control Range: Bass, ±10 dB at 20 Hz; treble, ±10 dB at 20 kHz.
Loudness Contour at −30 dB: +10 dB at 20 Hz, +6 dB at 20 kHz.
Subsonic Filter (Phono Only): −12 dB per octave, below 20 Hz.

General Specifications

Power Requirements: 120 V a.c., 50/60 Hz; 270 watts maximum.
Dimensions: 16 15/16 in. W × 3 15/16 in. H × 14 9/16 in. D (43 cm × 10 cm × 37 cm).
Weight: 18 lbs., 10 oz. (8.5 kg).
Price: $599.
Company Address: 19701 South Vermont Ave., Torrance, Cal. 90502.
For literature, circle No. 91

This is not the first time Nakamichi has attempted to broaden its product mix by introducing components other than the tape decks that have made the company justly famous. Using the "Stasis" technology which it licensed from Threshold Corporation (more about this in a moment), Nakamichi has introduced a pair of receivers, the higher powered of which is evaluated here. By today's standards, the SR-3A's 45-watt-per-channel power rating is only moderate, but as my listening tests revealed, you can't always equate steady-state power output ratings with loudness levels. The SR-3A sounds more powerful than its rating suggests. By the same token, you can't judge how clean an amplifier will sound simply by reading its THD or IM specifications. The distortion numbers for the amplifier section of the SR-3A are not among the lowest I've seen in modern receivers, yet the sound produced by this carefully designed component seemed cleaner than what I've heard from receivers or amplifiers boasting THD figures that have several zeros to the right of the decimal point.

The Stasis Concept

In an amplifier employing Stasis topology, two amplifiers drive the load. The first is an extremely high-quality, low-distortion, low output-impedance amplifier with relatively modest current capability. The other is a high-impedance, high-current "bootstrap" arrangement. Because of the impedance difference, the low-impedance amp determines the voltage across the load while the high-impedance amp supplies the needed current. To the extent that the high-impedance amp distorts high-level signals, the low-impedance amp delivers current to correct the error. However, since this correction current represents a negligible amount of power, the low-impedance amplifier operates in a virtual "stasis" or state-of-equilibrium condition and generates almost no distortion. And since this is the section that determines overall distortion, the amplifier as a whole is as good as the Stasis section itself. This arrangement also eliminates the need for overall loop or global feedback. (*Editor's Note*: For Threshold's own explanation of the Stasis circuit, see our "Equipment Profile" of the Threshold SA/1 amplifier elsewhere in this issue.)

The SR-3A receiver incorporates many other features worth noting. The power supply employs a multiple-winding power transformer with separate rectifiers and regulators for audio, tuner, display, and video circuitry. An "isolated-ground subregulator" system is used in order to prevent interstage interference by eliminating ground currents.

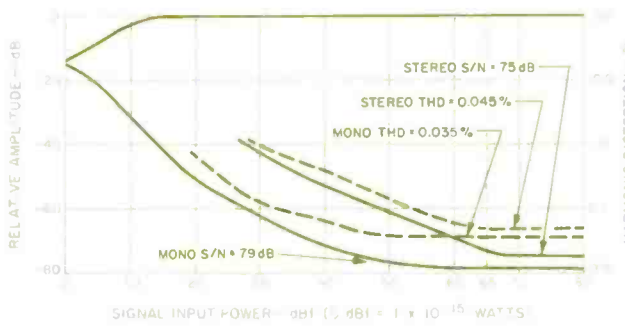
The phono preamplifier circuit is a low-noise, high-trans-

conductance, FET design. Its moving-coil cartridge input has selectable gain to accommodate low- and high-level MC cartridges, and the RIAA equalization network is direct-coupled for accurate response over the entire audio band.

A steep-slope subsonic filter in the phono section is defeatable, as are the loudness-contour circuit and the bass and treble tone-control circuits. Video inputs as well as a video monitor output are provided so that the receiver can serve as the main control center for an integrated audio/video component system. Extensive protection circuitry guards against d.c. leakage, overload, and overheating.

The tuner section is a frequency-synthesized quartz-lock design with 10 available presets plus manual and auto-seek tuning for both AM and FM signals. The front-end employs twin-varicap diode tuning (equivalent to four-gang tuning) and a dual-gate MOS-FET front-end r.f. stage. A tuner buffer amplifier isolates the tuner from other program sources. Associated with the tuner section is a panel display that shows the band (AM or FM), tuned-to frequency, stereo signal reception, signal strength, quartz-lock status, and auto-seek tuning status.

Fig. 1—Mono and stereo quieting and distortion characteristics, FM tuner section.



Control Layout

Next to the power switch at the left of the front panel are separate "Tape/VCR Monitor" and "Input Selector" rotary controls. The tuner display area is to their right, and two rows of six angled pushbuttons are arranged below the display. The upper buttons, from left to right, take care of preset memorization, AM and FM band selection, tuning-mode selection, and down and up tuning (manual or auto).

With signal inputs above the lowest levels, my test results met or exceeded Nakamichi's claims in almost every respect.

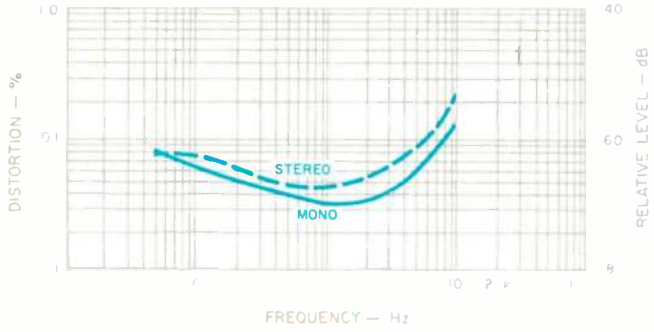


Fig. 2—THD vs. frequency, FM tuner section.

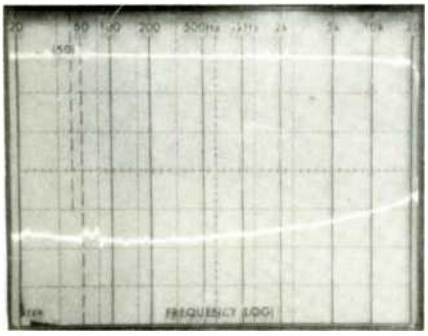


Fig. 3—FM frequency response (top trace) and separation vs. frequency.

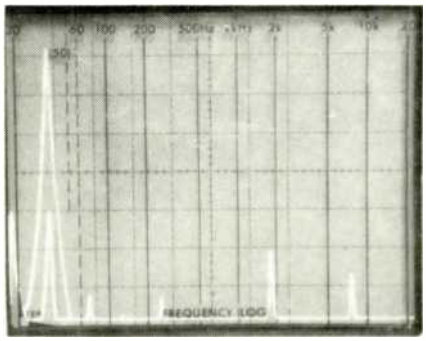


Fig. 4—Separation and crosstalk components for a 5-kHz modulating signal, FM tuner section.

The lower row of buttons is used for memorizing and accessing the 10 station presets, any of which may be used for AM or FM. This can be accomplished with only six buttons since five of them are each responsible for *two* presets, with the sixth acting much like a typewriter "shift" key, selecting the first five presets or the second five. Dual-concentric master volume and balance knobs are at the extreme right end of the panel.

Secondary controls, located along the lower left section of the panel, include a stereo headphone jack, speaker selector switches, bass and treble tone controls, a tone-defeat switch, and the subsonic filter on/off switch. A loudness on/off switch is at the extreme lower right.

FM and AM antenna terminals are on the rear panel. A separate AM loopstick antenna and mounting hardware are provided for those who don't want to install an outdoor AM antenna (and that means most of us). A small slide switch selects 24- or 32-dB gain levels for the moving-coil inputs. The usual audio input jack pairs are centrally positioned on the rear panel, along with not-so-usual video inputs and a video monitor output. Provision is made for connecting both the video input and the video output (for playback) of a VCR, as well as the associated audio input and output signals of that same VCR. Two sets of speaker terminals are near the right end of the rear panel, along with a pair of switched a.c. convenience outlets.

Tuner Measurements

Nakamichi supplies a matching transformer in case you don't want to use a coaxial antenna transmission line. Because my FM generator has only a 50-ohm output and a 50/300-ohm matching transformer, I had to use that transformer plus the Nakamichi transformer to get a proper match for the SR-3A's 75-ohm input. I am quite sure that all of this stepping up and stepping down resulted in some signal loss, which would explain why I couldn't measure better than about 14 dBf for mono usable sensitivity, as against the 11.0 dBf claimed by Nakamichi. When I increased signal inputs above these low levels, my results and Nakamichi's claims agreed in almost every other respect. In most instances, in fact, my sample did a bit better than claimed. For example, Fig. 1 shows how quieting and distortion improve with increasing signal level. Signal-to-noise ratio for mono, with 65-dBf signals applied, was 79 dB, exactly as claimed. In stereo, S/N measured 75 dB or a bit better than claimed. THD at 1 kHz measured only 0.035% in mono and rose negligibly to 0.045% in stereo. Both figures are better than the manufacturer's specifications.

Figure 2 plots harmonic distortion versus frequency for the FM tuner section. Unlike the many tuners which exhibit very high distortion levels in stereo as higher and higher frequencies modulate the FM carrier, this section's THD at 6 kHz in stereo was a mere 0.1%, only marginally higher than in mono. Even at 10 kHz, THD in stereo was only 0.23%. Frequency response was well within the 1.0-dB tolerance claimed by Nakamichi, being down only 0.7 dB at 15 kHz. Figure 3 shows FM frequency response as well as stereo FM channel separation. At 1 kHz, separation from left to right measured an impressively high 52 dB; it was 48 dB from right to left. At 100 Hz and 10 kHz, left-to-right separa-

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Dynamic headroom was impressive, allowing the SR-3A to produce as much as 70 watts per channel for short signal peaks.

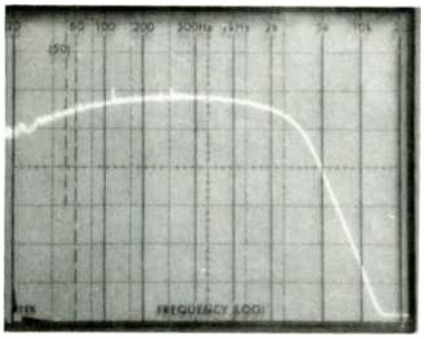

Fig. 5—AM frequency response.

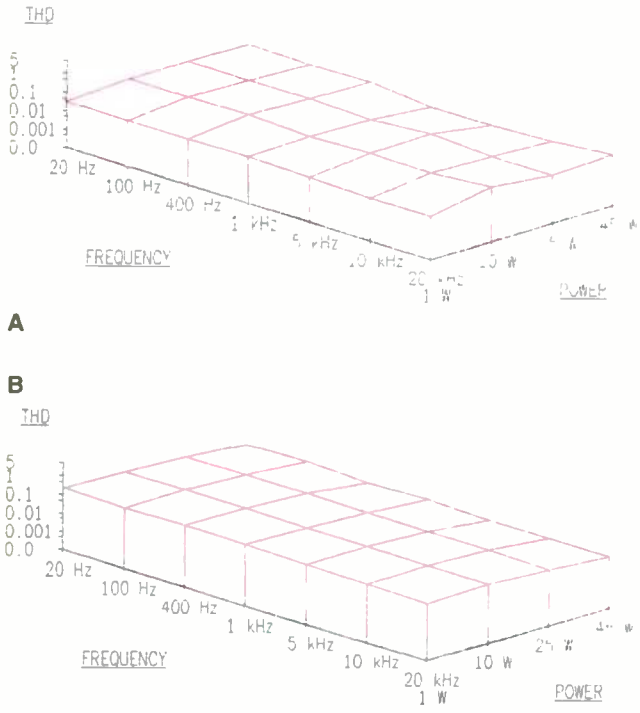

Fig. 6—Power output vs. frequency vs. THD, with 8-ohm (A) and 4-ohm (B) loads.

tion measured 51 and 42 dB, respectively, and right-to-left separation was 47 and 40 dB, respectively.

Figure 4 is the usual spectrum analysis 'scope photo which superimposes a 5-kHz, 100% modulated signal seen at the left output terminal and the crosstalk and distortion components seen at the output of the unmodulated opposite channel. The two components at the right of the display are sidebands at 33 and 43 kHz (5 kHz on either side of the suppressed 38-kHz subcarrier). The tuner section's 19- and 38-kHz rejection was a satisfactory (if not outstanding) 64 dB, and SCA rejection was 60 dB. Muting and stereo threshold both measured around 30 dB, and 50-dB quieting was 16 dBf in mono and 40 dBf in stereo. These last figures are again attributable to the signal losses in the transformers I had to use for the measurements. I have no doubt that with a direct 75-ohm to 75-ohm connection I would have been able to obtain Nakamichi's better 50-dB quieting and usable sensitivity figures.

I.f., image, and spurious-response rejection were all slightly better than claimed, and selectivity measured exactly 55 dB, as claimed. Capture ratio was 1.8 dB, and AM suppression measured 62 dB.

If you glance back at the manufacturer's published specifications for the SR-3A's AM tuner section, you'll notice that, like so many receiver makers, Nakamichi doesn't tell us about AM frequency response. Figure 5 offers a good reason for this omission, and the less said about it the better. I can't for the life of me understand why companies go to the trouble of designing AM tuner sections with nice r.f. stages, low distortion, and even decent signal-to-noise ratios (by AM standards), but fail to extend the response even out to a bare-bones 5 kHz or so!

Amplifier Measurements

The Stasis power amplifier section delivered 53 watts of continuous power at mid-frequencies for its rated 0.1% THD when coupled to 8-ohm loads. Even at the frequency extremes, available continuous output power was higher than claimed, with 50 watts per channel produced at 20 Hz and 53 watts per channel at 20 kHz. Backing off to the rated 45-watts-per-channel level, I measured THD of 0.02% at 1 kHz, 0.05% at 20 Hz, and 0.055% at 20 kHz. "Three-dimensional" plots of power output versus frequency versus harmonic distortion levels are shown in Fig. 6. Power output at 4 ohms was not all that much higher than it was at 8 ohms—at least on a continuous basis. Maximum output for 0.1% THD at mid-frequencies was 59 watts per channel. Dynamic headroom, on the other hand, was an impressive 1.9 dB with an 8-ohm load, which means that for short signal peaks, such as those encountered on music recordings, this amplifier section can produce as much as 70 watts per channel. No wonder it sounded "louder" than it measured on the bench!

Damping factor was a low 20, no doubt because of the fact that the Stasis circuit employs no overall loop feedback to lower the amplifier's output impedance. In my view, a damping factor of 20 is adequate for most of the popular speakers likely to be used with this receiver, so I wouldn't worry about it too much.

As for the SR-3A's preamplifier/control section, Fig. 7 shows how Nakamichi has designed the tone controls. No-

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It's the Matrix series of new digital monitors. The first ever loudspeakers to totally eliminate the colouration from the loudspeaker cabinet.

The bass has depth and body and no resonant boom.

The mid- and high-frequencies have a new sparkle and definition.

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The familiar, but greatly unloved hangover effect is dead. Long live the Matrix.

This revolution was achieved with an idea so very simple that B&W practically invented the Matrix by accident.

They discovered that all that is required to virtually eliminate unwanted sound radiation from the cabinet is a honeycomb-like structure of unique design inside it.

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Consequently, as well as the drivers with homopolymer cones manufactured under licence from CBS Inc., Matrix also features a newly designed ferrofluid tweeter.

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The emphasis is on good internal design rather than on superfluous frills and switches. Still, all the functions you're likely to want have been included.

tice that even with bass and treble controls in their full boost or cut positions, mid-frequency response remains totally unaffected. This is the way good tone controls should work, and it's no surprise that they do so on this carefully and thoughtfully designed receiver. Figure 8 shows the action and response of the loudness compensation circuit at various settings of the master volume control.

The subsonic filter, when turned on, attenuated phono response by 3 dB at 20 Hz, but at 10 Hz, response was already down more than 14 dB. The RIAA equalization from 20 Hz to 20 kHz was accurate to within 0.5 dB. High-level input sensitivity for 1 watt output measured exactly 29 mV. Phono input sensitivity for the same 1 watt output measured 0.44 mV for the moving-magnet inputs, and 9 or 24 μV for the moving-coil inputs, depending upon the setting of the MC gain switch.

Signal-to-noise ratio for the high-level inputs measured 86 dB below 1 watt, referred to 0.5 V input. With the volume control set at minimum, noise was 90 dB below 1 watt; referred to rated output, it would work out to just over 106 dB. Phono S/N measured 84 dB for the MM inputs, referred to 5.0 mV input and 1 watt output. The MC input S/N was 72 or 75 dB (referred to 0.5 mV input and 1 watt output), again depending upon the setting of the MC gain switch on the rear panel. Phono overload for a 1-kHz signal measured 150 mV for the moving-magnet inputs, 16 and 6 mV for the MC inputs. Overall frequency response via the high-level, tape, or audio/video inputs was flat to within 1.0 dB from 5 Hz to 75 kHz and within 3 dB from 2.5 Hz to 110 kHz.

I checked the tracking accuracy of the master volume control and found that from 0 dB (maximum setting) down to −60 dB, there was a tracking error of less than 0.5 dB. Of course, if you turn down the control still further, the error tends to increase, but you're not likely to do much listening at that level.

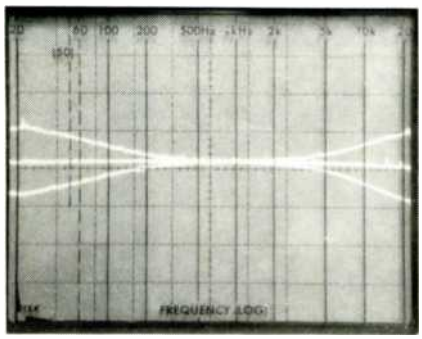


Fig. 7—Tone-control characteristics.

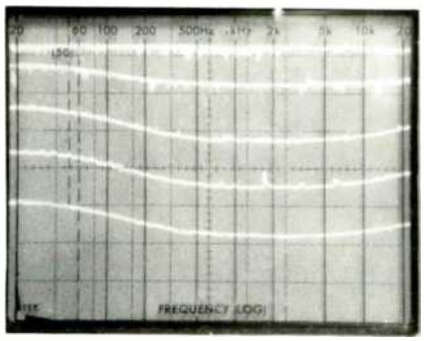


Fig. 8—Loudness-compensation control characteristics.

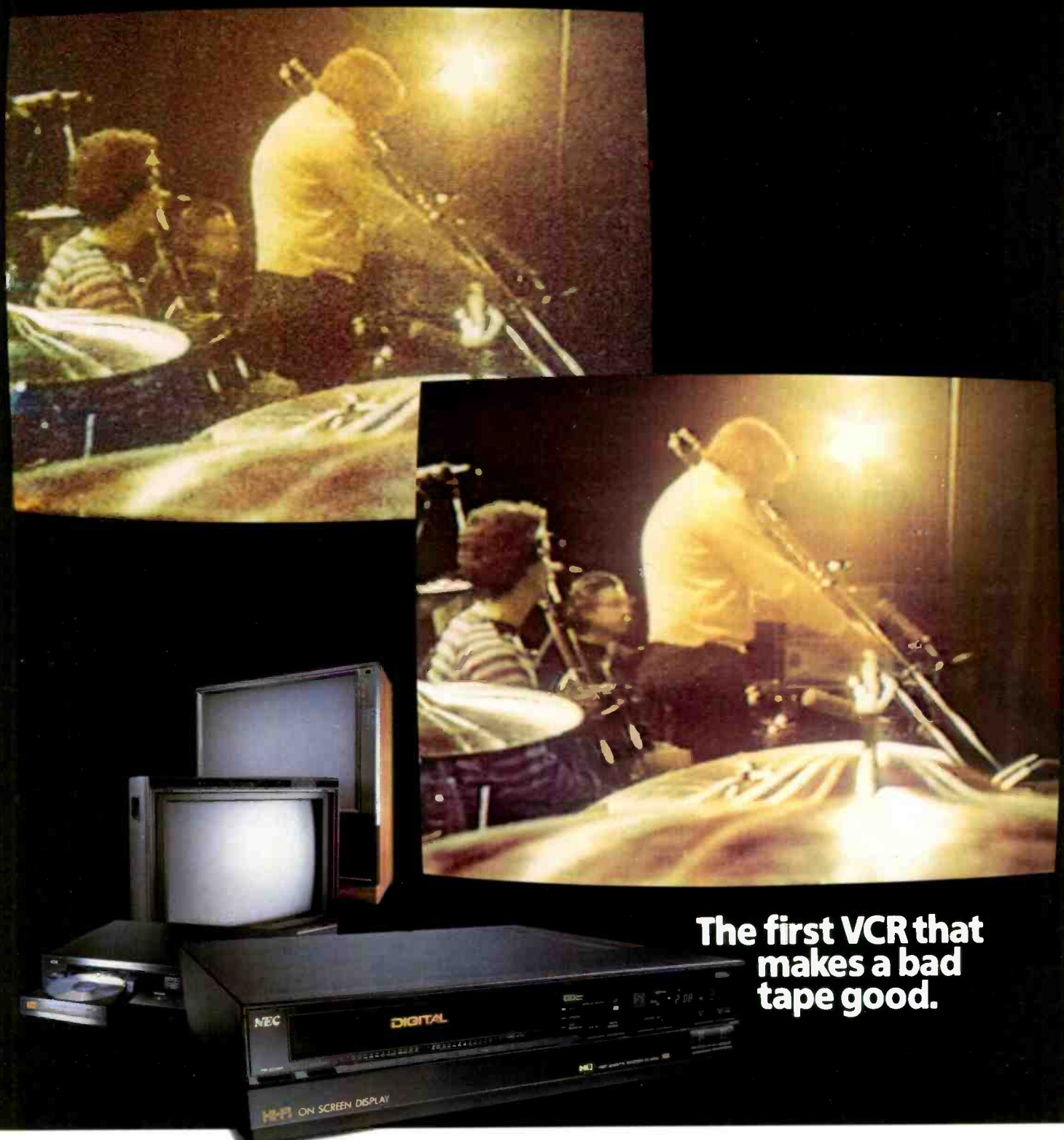
Use and Listening Tests

My overall reaction to the SR-3A is that, like all Nakamichi components I've evaluated in the past, the emphasis is on good internal design rather than on superfluous (and often undesirable) external frills and extra switches or buttons. Still, all the functions you are likely to ever want in a receiver are included, and I get the feeling that each switch and circuit was given careful thought as to its necessity, its design, and its position on the front panel.

The SR-3A, if judged solely on the basis of watts per dollar, is not likely to be the universal choice of the casual listener. On the other hand, after doing some serious listening, I concluded that the Stasis technology does make for the very clean-sounding amplifier which advanced audiophiles choose. Even with its higher-than-usual dynamic headroom, the power of this receiver should be matched with fairly efficient loudspeaker systems. Fortunately, there are plenty of good ones available these days; speakers with a sensitivity rating of 90 dB or better are what you should look for as most suitable for use with the SR-3A.

Connected to a good outdoor antenna (and yes, this time with a 75-ohm coaxial transmission line), the tuner section pulled in all of the stations I normally expect to receive with a good, sensitive unit. I might have liked a somewhat lower stereo threshold; by the time stereo switches on, signal-to-noise ratios are quite acceptable, and I suspect that a somewhat lower switching point could have been tolerated by most listeners. There's no way to defeat the muting threshold while you are in the stereo mode. Muting threshold is set at about the same point as the stereo threshold, so if you want to do a little serious DX-ing on the FM band, you'll have to settle for mono.

I was very pleased with the phono performance too, especially the action of the subsonic filter. It didn't intrude upon musical content at all, but it noticeably cleaned up the sound of some of my LPs when they were played on a turntable known to have very poor signal-to-noise (call it signal-to-rumble) figures. If your only experience with Nakamichi is with their indisputably superb cassette decks, you're in for a pleasant surprise when you audition this receiver or its lower priced, 30-watt-per-channel companion, the SR-2A. *Leonard Feldman*



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3

DBX SOUNDFIELD TEN SPEAKER SYSTEM

Manufacturer's Specifications

Loudspeaker

System Type: Three-way, eight-driver, equalized.
Drivers: Two 10-in. (25-cm) acoustic-suspension woofers; two 4½-in. (11-cm) midranges; four ½-in. (1.3-cm) dome tweeters.
Crossover: Approximately 450 Hz and 3,150 Hz, depending on driver.
Frequency Response: 30 Hz to 20 kHz, ±2.5 dB (with controller/equalizer).
Sensitivity: 90 dB SPL at 1 meter for 2.83 V, mid-band, typical room.
Nominal Impedance: 4 ohms.
Recommended Amplifier Power: 40 to 300 watts.
Dimensions: 16 in. W × 14½ in. D × 34¾ in. H (41 cm × 37 cm × 88 cm).
Weight: 65 lbs. (30 kg).

Controller

Distortion: 0.05% THD or IM.
Maximum Input: 2.5 V, nominal; 0.5 V, 20 Hz to 20 kHz.
S/N Ratio: 88 dBA, re: 1 V.
Input Impedance: 212 kilohms.
Output Impedance: 330 ohms.

Price: $1,399 per pair, with controller.
Company Address: 71 Chapel St., Newton, Mass. 02195.
For literature, circle No. 92

Creation of a sound field that provides a measure of stereo imaging for everyone in the listening room is the goal of dbx loudspeaker systems. Former dbx engineer Dr. Mark Davis pointed out, in a 1984 white paper, that unequal propagation delays from two speakers to an off-center listener cause a collapse of the sound stage into the location of the nearer speaker. Davis experimentally derived a radiation pattern that would compensate for these sound-image shifts by making the far speaker louder than the near one. The question is, could dbx devise a system that would let us listen anywhere without sacrificing imaging fidelity usually found only at the "sweet spot"?

dbx is best known to the hi-fi enthusiast for their noise-reduction systems, dynamic range expanders, and other signal processors. For the professional audio world they also manufacture noise-reduction systems, a processor for (non-PCM) digital audio recording, and a line of signal processors such as equalizers and compressor/limiters. They also developed the noise-reduction portion of the MTS television stereo system. These are impressive credentials in the areas of psychoacoustics and engineering. It is natural that this talent would be applied to the development of a high-fidelity speaker system, the most difficult of all challenges in psychoacoustics.

The first speaker from dbx, the Soundfield One, was announced in the spring of 1984 at a price of $2,500. The Soundfield Ten followed about a year later at a much lower price and was so well received that the original One (now the 1A) was substantially redesigned to keep it on top. Even lower priced models, the 100 and the 1000, have recently been introduced.

The Ten is a squat but attractive floor-standing speaker. Its oak-veneer cabinet (also available in walnut) is fitted with brown knit grille assemblies on two opposite sides and the top. As normally deployed, the wood panels without the grilles face the listening area. A label on each speaker indicates the proper orientation toward the other speaker. Other placement recommendations are that the pair be widely spaced but kept a foot or more from side walls.

The driver complement for each speaker consists of a 10-inch woofer and 4½-inch midrange on each side panel and an array of four ½-inch dome tweeters. The tweeters are mounted on top, in a molded particleboard structure which aims them in all four directions and slightly upward. The tweeter facing the other speaker looks different from, and plays louder than, the other three. The grille cap, which covers the tweeter array, has a solid top and a substantial wood frame. Like the beacon of a lighthouse, the tweeters are in a little room, looking out the "windows."

An elaborate crossover network inside the cabinet determines not only the crossover points but the amplitude and phase relationships between and among the drivers which produce the egg-shaped horizontal radiation pattern required by Mark Davis' studies. The complex task of determining the crossover's component values was handled by a computer simulation. Figure 1 shows a printout, from dbx's computer, of the signal amplitudes feeding each driver in the Ten.

Passive crossovers are commonly designed to equalize a speaker's overall response, in addition to their primary function of dividing the signal into lows, mids, and highs. The Ten's passive crossover is complex enough, so spectral balance is equalized by a small "controller" patched into the preamp's tape loop or between preamp and power amp.

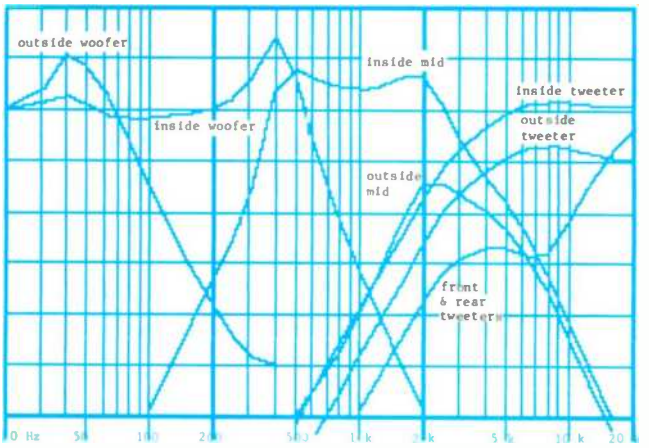

Fig. 1—dbx computer simulation printout of amplitudes of the signals fed by the crossover to each of the Soundfield Ten's eight drivers.

Three rotary controls and a pushbutton on the controller modify a hefty baseline equalization of nearly ±10 dB over the audio range. The high-frequency control provides a gentle up or down tilt for the entire spectrum. The low-frequency control boosts or cuts only the extreme low end. The "Wall EQ" button introduces a ripple in the response to compensate for the one produced acoustically when the speakers must be used very close to the wall behind them. An "Ambience" control is intended to either tighten or open up the stereo image. It works by blending in midrange signals from the opposite channel, either in phase or out of phase. Each of these unusual control functions is a welcome addition to the normal preamp controls which work best as program equalizers. The dbx controller can be thought of as providing optimal speaker/room interface compensation.

Measurements

The controller was measured electronically, the way any other signal processor might be. The frequency amplitude response with high- and low-frequency controls set to normal, maximum, and minimum is shown in Fig. 2. Measurements of crosstalk (the inverse of channel separation) show the effect of the "Ambience" control. These are plotted in Fig. 3 for maximum increased ambience and in Fig. 4 for maximum decreased ambience. With this control in its detented center position, separation was 30 dB from 20 Hz to 20 kHz—certainly adequate, but far from the 80 dB often demanded of CD players. Figure 5 shows the effect of engaging the "Wall EQ" button.

By making the far speaker louder than the near one, the Ten's radiation pattern compensates for shifts in sound image heard by an off-center listener.

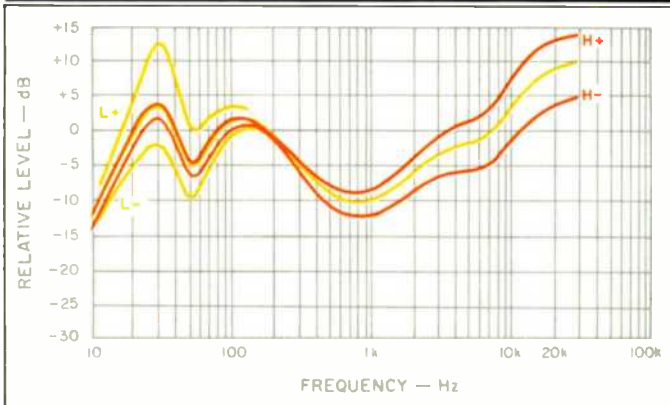

Fig. 2—Controller frequency response with high- and low-frequency controls set to normal, maximum, and minimum.

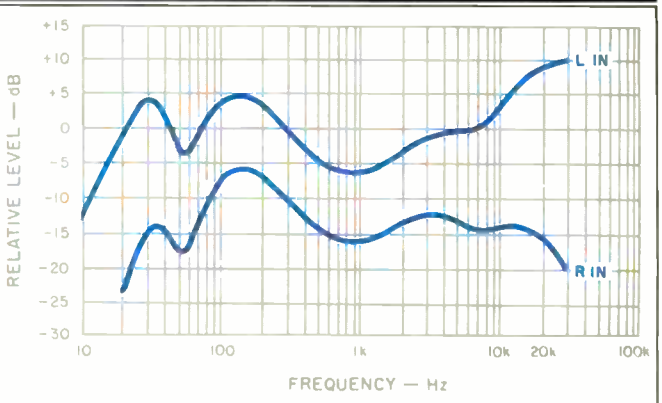

Fig. 3—Controller crosstalk with "Ambience" control set for maximum increase ("+"). Antiphase signal from the opposite channel enhances spaciousness. Top curve shows left-channel output with signal fed to left input; bottom curve shows same output with signal fed to right output.

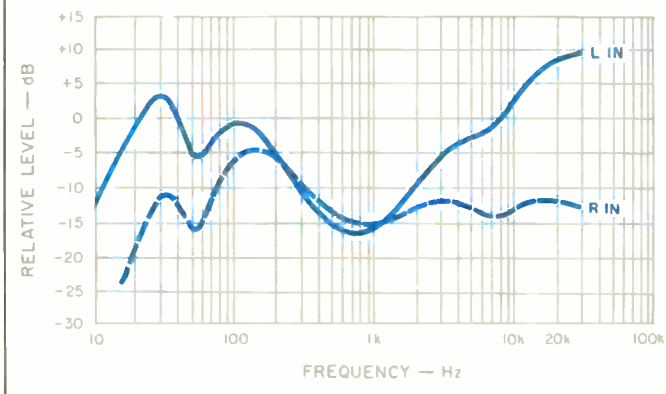

Fig. 4—Controller crosstalk with "Ambience" control set for maximum decrease ("−"). In-phase signal from the opposite channel decreases spaciousness. Note that separation decreases most at mid-frequencies.

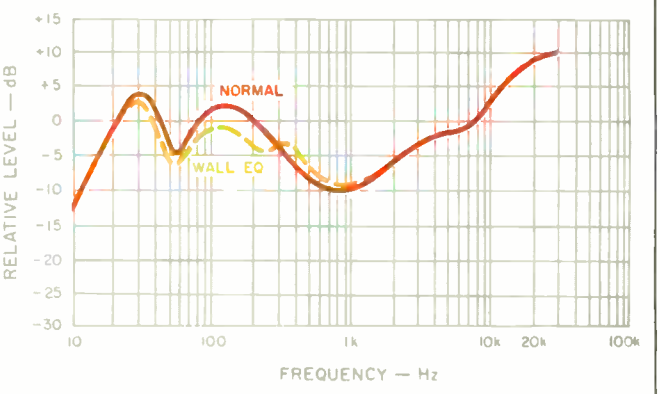

Fig. 5—Effect of controller "Wall EQ" setting allows the speaker to be placed against the wall behind it. See text.

Such a controller should be designed to accept the full maximum output voltage of a CD player (around 2 V) at its input. It should, in theory, also be able to provide 2.5 V of output to drive powerful amplifiers to their maximum output. The dbx controller falls slightly short of both goals in some EQ areas. Perhaps this is not a probable situation, given music's normal spectral distribution, but it would be comforting to have some headroom. It could occur, however, when the controller is used to directly feed a power amplifier with gain controls; they must be run wide open to avoid clipping in the controller.

Speaker impedance magnitude versus frequency is plotted in Fig. 6, and complex impedance is shown in Fig. 7. The 4-ohm average and the dip to just above 2 ohms at 450 Hz make this a difficult load to drive. You can expect a "lightweight" amplifier to "thermal out" when playing compressed material at high volumes for long periods. Use an amp rated for low-impedance loads and you will have no problem.

All of the remaining data on the Ten was taken as a controller/amplifier/speaker system. I used 1 kHz as a reference frequency to set power input to 1 watt for response tests, but the amplifier power at other frequencies was determined by the amount of equalization.

Anechoic frequency response, plotted in Fig. 8, is measured at a distance of 1 meter from the center of the "front" panel. This is the panel facing the listener, but it is not either of the two panels that contain a woofer and midrange. The "maximum" radiation panel is the one facing sideways, towards the other speaker. Figure 9 shows the response on

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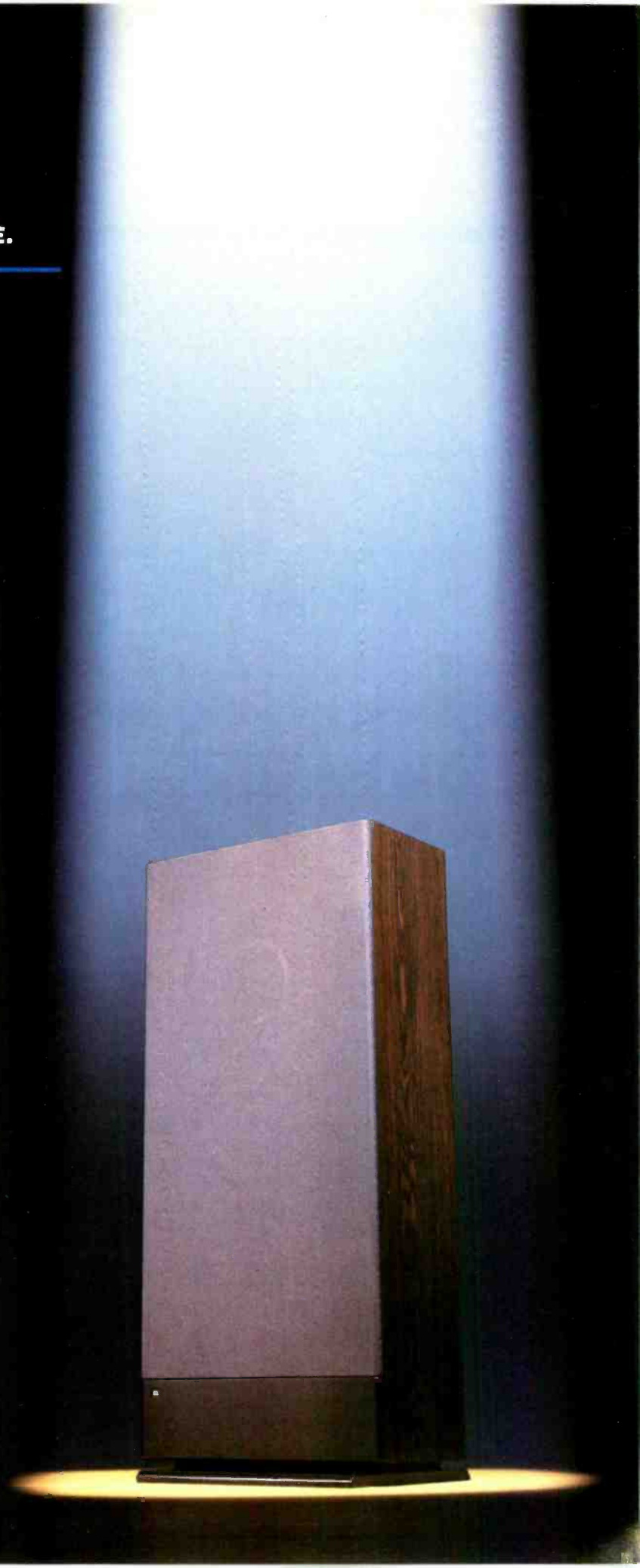


One-third-octave analysis gave excellent results. More important, the pink noise used for the test sounded smooth and even as I moved around.

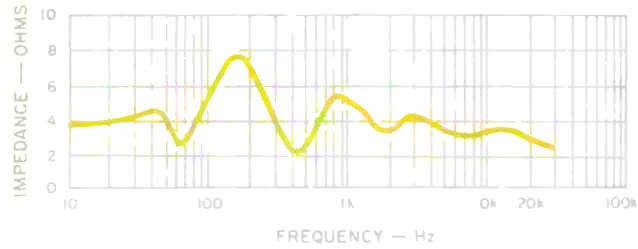
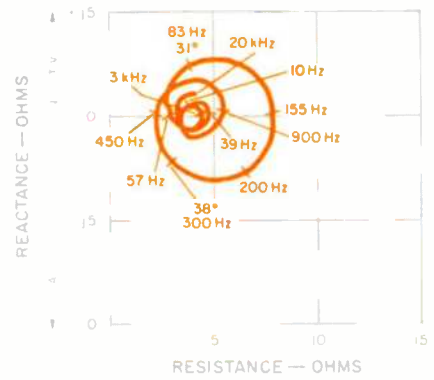


Fig. 6—Impedance.

Fig. 7—Complex impedance. Note relatively small phase angles.



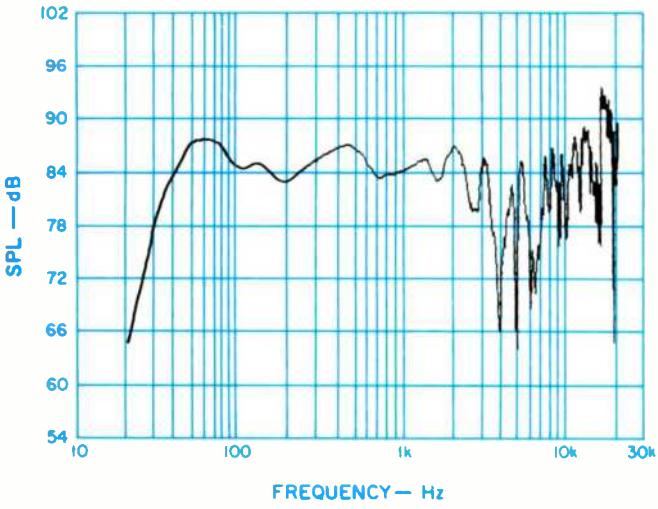


Fig. 8—Anechoic frequency response, 1 meter from panel facing the listener. Note irregularities due to multiple drivers and tweeter cover.

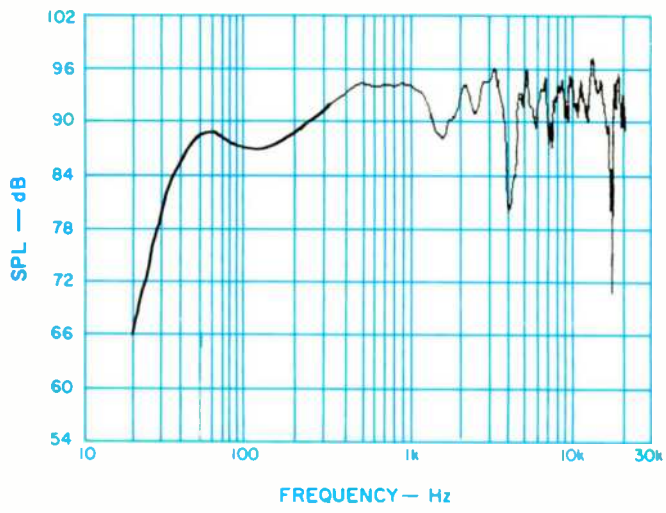


Fig. 9—Anechoic frequency response, 1 meter from axis of maximum output, showing irregularities similar to Fig. 8, and greater output.

the axis of the maximum panel. The roughness is due to the interaction of the multiple drivers and to the reflections from the tweeter cover; dbx, and others, feel that this roughness is not heard as such and therefore is unimportant compared to the smoothness of the average. In any case, dbx could not achieve their desired radiation pattern without multiple drivers, so the roughness inherent in this type of measurement is inevitable.

It is quite clear from dbx's literature that these speakers are designed for performance as a stereo pair in a living room. Of all the measurements I regularly make on speakers, only the 3-meter room response plot includes the effect of the listening room. The dbx Ten's frequency response specification is 30 Hz to 20 kHz, ±2.5 dB, for a stereo pair fed with uncorrelated pink noise and analyzed with a ⅓-octave frequency bandwidth. This is a traditional and well-regarded technique for measuring control-room monitors and sound-reinforcement systems, though much detail is lost.

Figure 10 is a plot of the ⅓-octave analysis performed in this manner, with the controller adjusted for flattest response. The measured result is excellent, but exhibits the low-frequency variations I expect from any speaker in any room. More relevant to me is that the sound of the pink noise in the room was smooth and even, with no swishing or "phasing" noises audible as I moved around. Also interesting is that while most good-sounding speakers exhibit some high-frequency roll-off in this measurement, the Tens sounded fine, with a measured flat response. Perhaps this is a result of the diffuse sound produced by their multi-directional radiation pattern.

The cause of the irregular anechoic frequency response is evident in the 1-meter energy-time response, shown in Fig. 11. The arrival-time spread is shown for the front radiation direction. The multiple arrivals combine in a complex and frequency-dependent manner to produce additions and cancellations which are seen as roughness in the fre-

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*100 Watts/ch., continuous RMS, both ch. driven, 8 Ohms, 20 Hz-20 kHz, 0.02% THD

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The 3-meter room response test shows that the Ten interacts strongly with the room, as we should expect from its multi-directional radiation pattern.

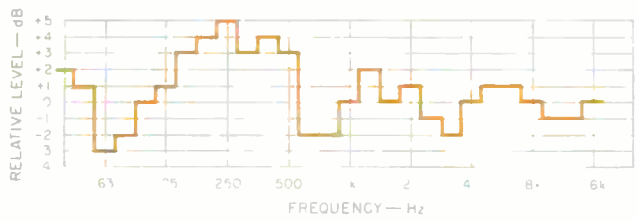

Fig. 10—Frequency response measured to dbx specifications: ⅓-octave analysis, two speakers in a room, using pink noise and optimal adjustment of the controller. dbx believes that narrow-band measurements are less informative.

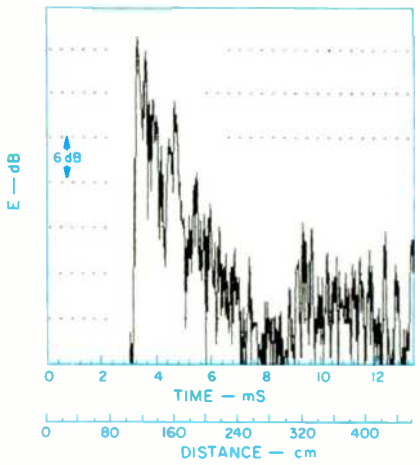

Fig. 11—One-meter energy-time response. Multiple arrivals are responsible for the irregularities.

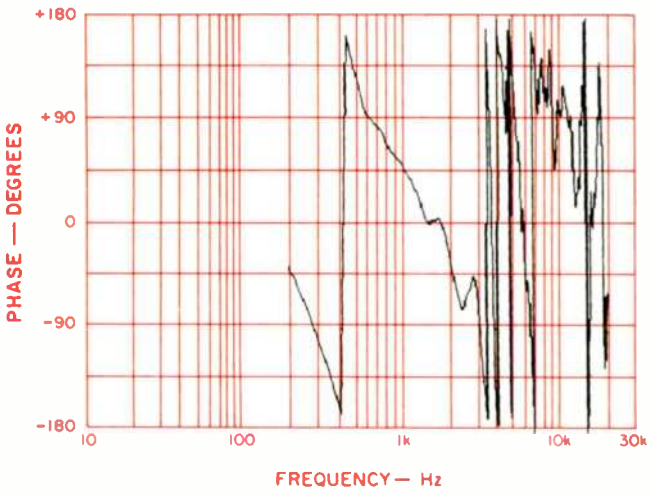

Fig. 12—System phase response at 1 meter. See text.

quency response. The smooth decay of these arrivals and reflections resembles what you would get in a tiny room.

The 1-meter phase response for the front radiation direction is plotted in Fig. 12. It is erratic, like the frequency response, and for the same reasons. The time offset of the analyzer is set to exactly match the time it takes the sound to travel from the front-firing tweeter to the microphone. This setting is also accurate at lower frequencies for the midrange and woofer. Between 3 and 15 kHz, however, the range of this phase plot cannot accommodate the extreme and rapid phase shifts caused by an interaction of delayed sounds from other tweeters and internal reflections.

The 3-meter room response, plotted in Fig. 13, shows that the Ten interacts strongly with the room, as we should expect from its multi-directional radiation pattern. Figure 14 is the room response measured 30° off axis towards the maximum radiation panel. Together, these curves show the increase in off-axis output that dbx intended. Note also that the effect of the inevitable room reflections is much like that of the multiple drivers and cabinet reflections in the anechoic plots, except that the irregularities introduced in the response are greater.

Wide directivity in the extreme is shown in the "three-dimensional" horizontal response plot of Fig. 15. The plot comprises 31 individual frequency response curves from 200 Hz to 20 kHz, taken every 6° from the front, around the side, to the rear of the cabinet. Note the increased output at 90°, the direction of maximum radiation.

Directivity is also shown for the vertical direction, in Fig. 16. The measurements start at the front, go across the top, and end at the rear of the speaker. High-frequency output is seen to be very great, except for straight up, because the solid top of the tweeter cover blocks this radiation. Both plots again show the dense frequency response structure resulting from multiple drivers and cabinet reflections.

Woofer nonlinearity was tested by observing harmonics of sine waves applied at 41.2, 110, and 440 Hz (musical notes E_1, A_2, and A_4) in Figs. 17, 18, and 19, respectively. Distortion of 41.2 Hz at high power levels is high, and one should consider how much the equalizer is boosting this frequency relative to mid-band levels. The 110- and 440-Hz measurements reveal much less distortion, but it is rising quickly at the highest power amplitudes used, 100 and 80 watts, respectively.

Modulation of a midrange tone (440 Hz) by a bass tone (41.2 Hz) reveals additional nonlinearities in the woofer. Intermodulation of these pure tones, which are mixed in a 1-to-1 ratio before being fed to the controller, is plotted in Fig.

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dbx's goal of acceptable stereo over a wide range of listener positions is achieved to a remarkable degree in these speakers.

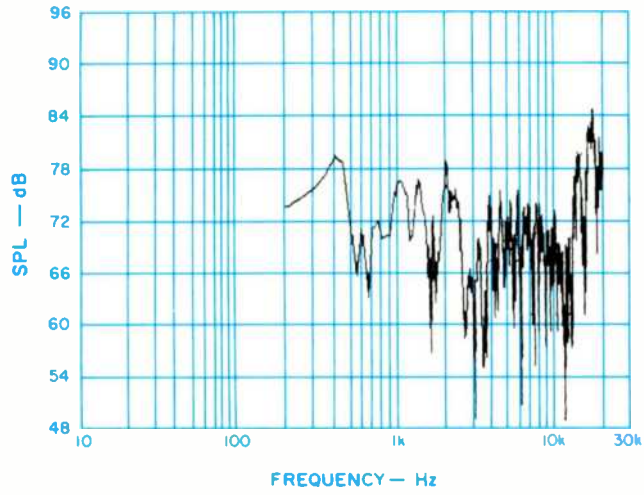

Fig. 13—Three-meter room response, on front axis. Normal room reflections produce irregularities greater than those caused by interference and reflection within the cabinet.

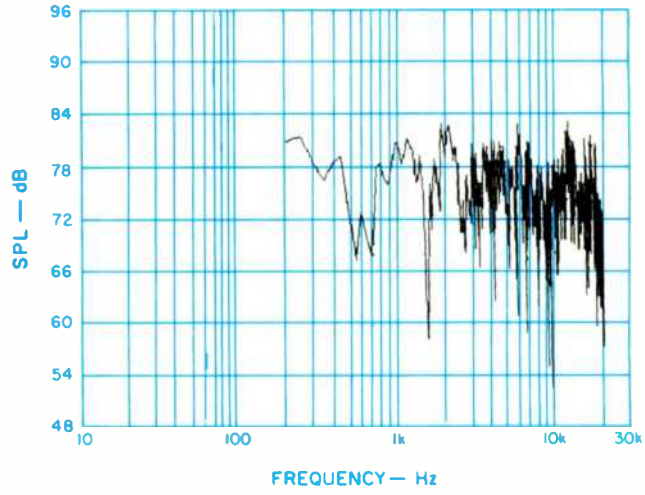

Fig. 14—Three-meter room response, 30° off axis towards maximum-output panel of one speaker.

20. The equalization in the controller changes the balance of power such that 10 times the electrical power is applied to the speaker at 41.2 Hz as at 440 Hz. The acoustical output is, however, approximately 1 to 1. Measured performance indicates 10% distortion, an objectionable amount, being exceeded when more than 20 watts is applied.

Power linearity is a measure of change in frequency response as power to the speaker is increased. A deviation from a straight line indicates that the speaker is in trouble. The tests are fairly quick, taking only a few seconds to cover the entire audio band. Compression seen in these tests is, therefore, usually due to severe distortion rather than to more benign heating effects which can reduce SPL without waveform distortion.

The response equalization in the Ten's controller makes the power linearity test tricky. The 1-kHz reference frequency is very near the frequency of maximum sensitivity of the speaker and is therefore one of minimal controller boost (actually 10 dB of attenuation). Referring to Fig. 2, and remembering that a 10-dB change is a 10-to-1 power ratio, a signal amplitude requiring 1 watt of input at 1 kHz can be seen to require nearly 100 watts at 20 kHz (20 dB more). Maybe we can give the four ½-inch tweeters a brief exposure to 100 watts in this test, but we certainly can't go up from there.

I decided to use 0.1 watt at 1 kHz as a reference and limit low-frequency power to 200 watts. High-frequency power is limited to 100 watts. The result is shown in Fig. 21. The self-imposed power limits do not stress the frequency extremes the way certain Compact Disc "sonic spectaculars" might, but within these limits the Ten shows respectable linearity.

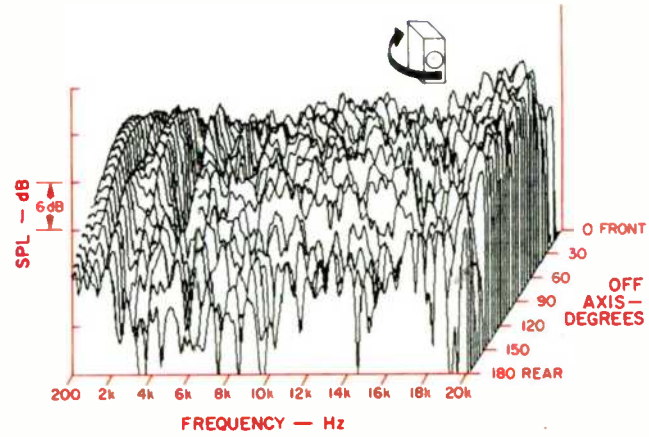

Fig. 15—Horizontal off-axis frequency response from front to rear of speaker. Note wide directivity and maximum output at 90°.

Use and Listening Tests

I must admit that I got off to a bad start with the Tens. When first making connections to the high-quality five-way binding posts, I found that they were all loose. Furthermore, the terminals on the wires that connect to the binding posts physically prevented me from getting an effective tool on the nuts to tighten them. When secure connections were finally made, I heard a buzzing from one of the woofers. On investigation, I found that a ferrite inductor core from a

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Large-scale performances in reverberant space were accurate and warm, but the Tens didn't fare so well on drier recordings.

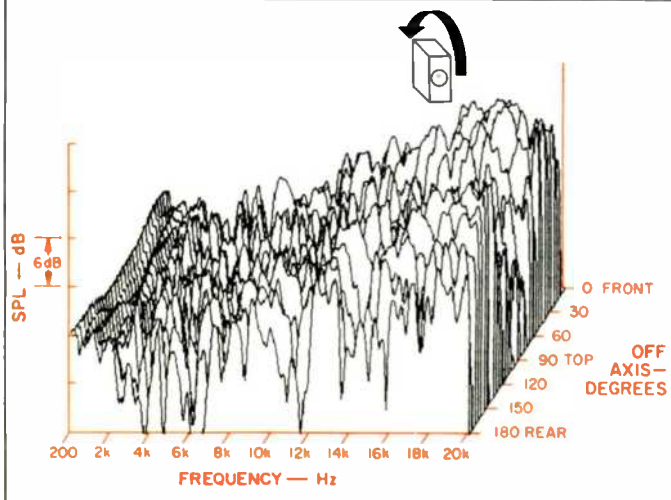

Fig. 16—Vertical off-axis frequency response from front, over top, to rear of speaker. Note wide directivity and the blocking effect of the tweeter cover.

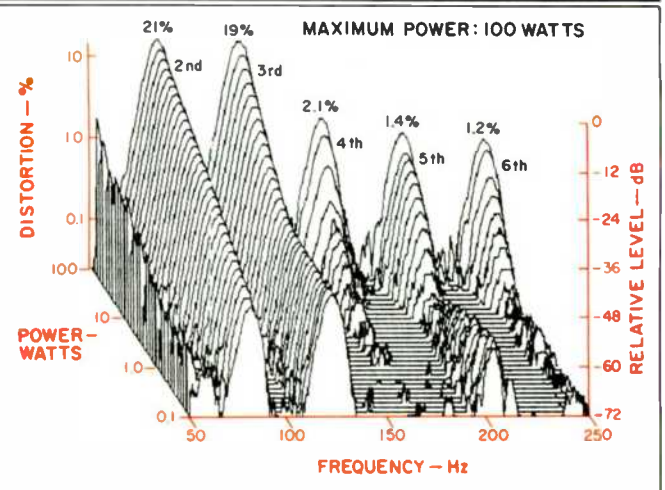

Fig. 17—Harmonic distortion for the musical tone E_1 (41.2 Hz).

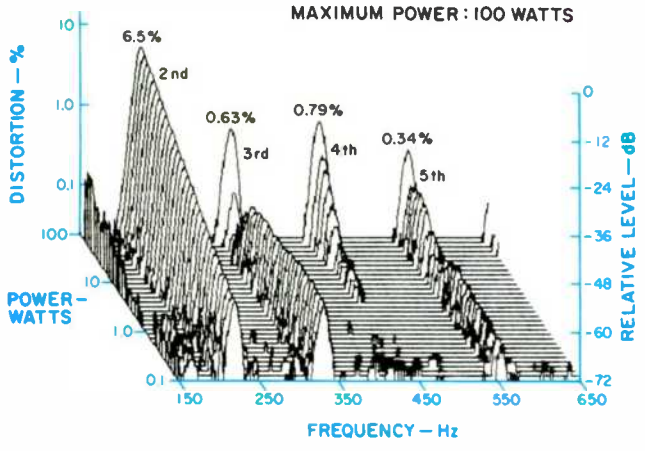

Fig. 18—Harmonic distortion for the musical tone A_2 (110 Hz).

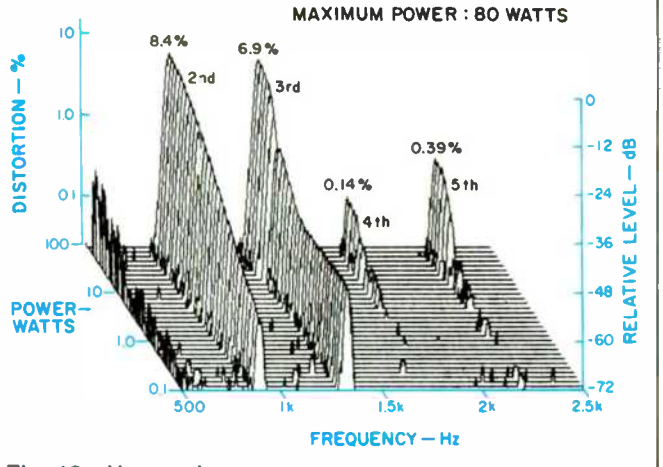

Fig. 19—Harmonic distortion for the musical tone A_4 (440 Hz).

crossover coil had broken loose and become lodged between the cone and the frame. It was but a minor chore to fix these problems, but I can imagine the frustration this would be to a new owner. My best advice is to buy from a competent dealer, even though I don't believe this will happen very often.

My listening room is well suited to exploiting the psychoacoustically derived radiation pattern of the Tens. It is rather live or reflective, and the walls behind the speakers and to their sides are free of obstacles, such as furniture or doorways, which could absorb or reflect the sound in an uncontrolled fashion. At 18 feet, the room's width allows a generous distance between speakers without forcing them too close to the side walls. I placed the speakers 3 feet out from the wall behind them and 8 feet apart, with their axes of maximum radiation aimed straight at each other, as dbx recommends. Equalizer controls were initially set to the "flat" or "normal" positions.

Recordings of large orchestras, such as the Telarc CD of the Berlioz "Requiem," were presented with a majestic spa-

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The Ten can accommodate a wide variety of tastes in an equally wide range of listening environments. In terms of flexibility, it has little competition.

ciousness within which individual sections or soloists were clearly heard and accurately placed. While the most defined and stable image locations were heard on the center line between the two speakers, dbx's goal of acceptable stereo over a wide range of listener positions was achieved to a remarkable degree. Bass was powerful, requiring a slight reduction at the controller, and mids were, if anything, overly smooth and free of glare. The high end was strong and extended, making me expect more definition than I heard. In sum, the rendition of large-scale performances in reverberant spaces was accurate and warmly musical.

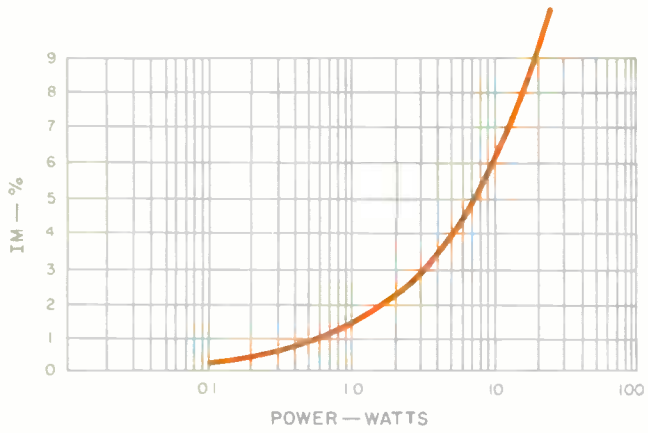

Fig. 20—IM distortion on A_4 (440 Hz) produced by E_1 (41.2 Hz) when mixed 1 to 1, before being fed to the controller's equalization. Above 20 watts, 10% distortion is exceeded and is audible.

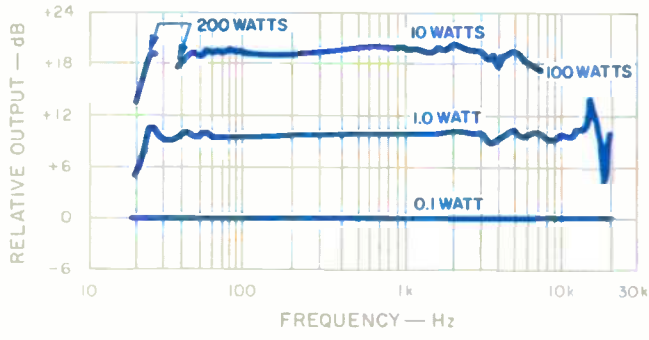

Fig. 21—Power linearity. Curves show change in frequency response at increased power inputs relative to response of 0.1 watt at 1 kHz. Results include effect of controller equalization.

The Tens did not fare so well on more dryly recorded music where immediacy and sharp transient attacks are called for. One such recording is a Sheffield CD, *I've Got the Music in Me*, featuring singer Thelma Houston. A friend, expecting the usual hot, up-front vocal sound, exclaimed that it sounded like Thelma was singing from behind a sofa. To me, it sounded as if her voice had been modified by the studio technique called "vocal doubling," in which a delayed signal is mixed with the original to give a "fatter" or "gutsier" effect. Percussive sounds from the Sheffield CD *Drum Record* were reproduced with a too-distant perspective and softened attacks.

The dbx Ten's manual has advice for dealing with too much spaciousness. The first suggestion is to turn the "Ambience" control toward minimum. No setting was found to improve Thelma's centered voice very much, but a strong effect was noted on noncentered instruments and on spaciousness. For me, the minimum end was more mono sounding, but did not solve the problem. The maximum rotation gave a "phasey" sound which I found annoying. I simply left it centered. The "If all else fails . . ." instruction for drying out the sound worked great. The manual suggests rotating each speaker slightly so the axis of major radiation begins to face into the room instead of at the other speaker. This action seems to me to be a partial abandonment of the "Soundfield" concept in favor of conventional front-directed radiation. A full 45° rotation of the maximum output axis towards the listening area sounded best to me. With this rotation, you have to sit more or less in front, as with "cross-fired" conventional speakers. Also, a gentle treble roll-off, obtained from the controller, now seemed appropriate.

With these changes, the Tens began to sound very conventional—and very good on all music. It became apparent that this is a well-designed three-way system having excellent blending of driver responses and directivities. The five drivers aiming away from the listening area lend a sense of air and transparency, with only a slight effect on immediacy and definition.

Two special applications for the Tens come to mind. The first is stereo sound for video. The major problem with integrating picture and sound is that the off-center viewer/listener hears the dialog as coming from the nearest speaker, while the picture is still in the center. The Tens will eliminate this discrepancy; the dialog will stay centered while the music and effects span a wide sound stage. The second application is for background music in a courtyard or atrium, such as at an art exhibition. The Tens could be placed near the center and provide an even stereo effect for people on all sides.

The dbx Ten is an adaptable speaker system. It can accommodate a wide variety of discerning tastes in an equally wide range of listening environments. For oddly shaped rooms or when seating flexibility is a necessity, it has little competition. For the audio enthusiast with more conventional needs, the Ten has plenty of competition, but it holds up very well. *David L. Clark*

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PIONEER SA-V70 AMPLIFIER

Manufacturer's Specifications

Power Output: Stereo mode, 50 watts per channel into 8-ohm loads, 20 Hz to 20 kHz; surround mode, 25 watts per channel into 8-ohm loads, 20 Hz to 20 kHz (front channels), 100 Hz to 4 kHz (rear channels).

THD: Stereo mode, 0.09%; surround mode, 0.09% (front), 1.0% (rear).

Frequency Response: Phono, RIAA ±0.5 dB; high level, 20 Hz to 50 kHz, +0, −2.0 dB.

Audio Input Sensitivity: Phono, 2.5 mV; high level, 150 mV.

S/N Ratio: Phono, 73 dB; high level, 91 dB.

Tone-Control Range: Bass, ±10 dB at 100 Hz; treble, ±10 dB at 10 kHz.

Power Requirements: 120 V, 60 Hz, 180 watts.

Dimensions: 16 9/16 in. W × 5 1/8 in. H × 15 5/16 in. D (42.1 cm × 13 cm × 39 cm).

Weight: 24 lbs., 4 oz. (11 kg).

Price: Approximately $485.

Company Address: P.O. Box 1540, Long Beach, Cal. 90801.

For literature, circle No. 93

The SA-V70 audio/video control amplifier is, as its name implies, one of the growing number of audio components designed for use in A/V systems. The system in question is Pioneer's Foresight 77, which also includes either a 26-inch color monitor or a 40-inch projection TV, a combination CD and LaserVision videodisc player, a pair of three-way loudspeakers, and an AM/FM tuner, plus furniture to hold it all. System options include an 8-mm VCR that can also record digital audio, a linear-tracking turntable, rear speakers for surround sound, and an auto-reverse dual-cassette deck. The SA-V70 is designed to serve as the control center for all these, and therefore incorporates remote system control, inputs and outputs for video as well as audio, and surround sound.

My main purpose in testing this key audio element of the system was to determine if its quality was as high as that of Pioneer's separate audio components. After extensive lab and listening tests, I concluded that this amplifier certainly qualifies as a high-fidelity audio component, even if its measured performance is not quite up to the level of the current crop of mid-priced separate amplifiers. You'll see what I mean when the test results are presented.

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The SA-V70 had little dynamic headroom to handle musical peaks, but its 50-plus continuous watts make it adequate for efficient speakers.

Features and Layout

As its specifications show, the SA-V70's power can be divided in two ways. As a stereo amplifier, it delivers 50 watts per channel to a pair of stereo speakers. For surround-sound use, it divides its power into four channels of 25 watts each.

The remote-control unit for the entire A/V system is a detachable section of the amplifier's front panel; removing the remote exposes other controls of the amplifier. The remote has 37 buttons (some of them multi-purpose), and a display that shows the function selected. Once you use the remote unit to select any of the amplifier's 10 audio and audio/video inputs, the remote then switches button-control function to the appropriate component.

The amplifier control section of the remote selects surround mode; turns surround sound on and off and adjusts its volume; adjusts overall volume; turns muting on and off; selects stereo, left-only, or right-only sound (since many video sources are still mono), and turns the amplifier on and off. Another button switches the video monitor on and off.

A useful "Hold" function on the remote unit allows you to watch or listen to one Foresight component while operating a different one at the same time. For example, you could watch a TV program picked up by the monitor receiver while setting the system's VCR to record another program via its own tuner.

The controls revealed when the remote module is removed from the amplifier's front panel include touch switches ("Audio" and "Video") that advance the unit through the various input selection options, one by one, and touch switches for "Master Volume" ("−" and "+"). Controls along the lower edge of the panel, visible even when the remote is in place, include "Source" and "Rec Selector," a "Video Adaptor/Computer" switch (which allows you to connect an accessory device in series with the video signal path), and an "Audio Adaptor" switch which does the same thing for audio accessories (equalizer, time-delay unit, etc.). A stereo phone jack is at the extreme lower left of the front panel.

The upper left half of the front panel contains a series of 10 audio and video input function indicators, and additional indicators for record selection. Other lights show surround-sound, stereo, and muting status; a sliding scale illuminates to show volume level. Touch switches adjust channel balance, and a pair of slider controls are used to manually adjust bass and treble. A "Main Power" switch and a "Power Stand-By/On" switch are at the left end of the panel. "Main Power" must be turned on in order for the remote unit to control power to the amplifier or the other components connected to the amplifier's rear-panel a.c. receptacles.

I counted no fewer than 39 phono jacks on the rear panel of this master unit, for the many audio and video inputs and outputs that can be connected. In addition to these familiar jacks, there are also special receptacles for remote-control input and output cables, which interconnect with other components of the system. A mode switch chooses stereo or surround-sound (four-channel) operation. Speaker terminals are arranged so that either two or four speakers can be connected. Since video signals pass through this amplifier, an r.f. modulator is built in, with a selector switch for choosing either channel 3 or 4 on the rear panel. Six a.c. receptacles complete the rear-panel layout. Five of them are switched, while the sixth is an unswitched outlet intended for a VCR. This arrangement prevents the VCR's power from being switched off by the SA-V70 or its remote, thereby allowing the VCR to be switched on and off by its built-in clock/timer.

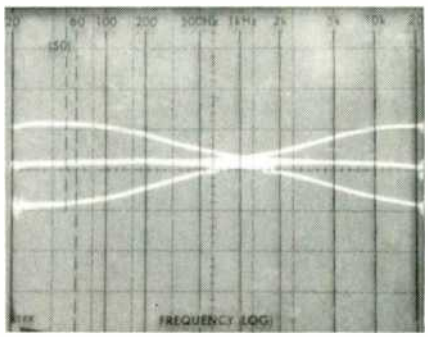

Fig. 1— Tone-control characteristics. Vertical sensitivity: 10 dB/div.

Measurements

The SA-V70's power amplifier section delivered 55.6 watts of power per channel for a 1-kHz input signal into 8-ohm loads for its rated harmonic distortion level of 0.09%. Even at the frequency extremes of 20 Hz and 20 kHz, power output remained at a 54-watt level for the same rated THD. Yet, dynamic headroom was very low, only 0.42 dB, indicating that when receiving music signals, the amplifier will not deliver much more power than it can when the input signal is a continuous test tone. Fortunately, the loudspeakers supplied with Pioneer's Foresight system are fairly efficient (90 dB/watt/meter), so they will probably deliver adequate acoustic power when driven by the SA-V70. Damping factor measured an adequate, if not spectacular, 42. Twin-tone IM (CCIF IM) was a very low 0.012%, and SMPTE IM at rated output measured 0.05%.

The preamplifier section measured very well on the test bench, with one or two exceptions. Overall frequency response for the high-level inputs was flat within 1 dB from 8 Hz to 30 kHz. The −3 dB cutoff points were at 4.5 Hz and 60 kHz. Signal-to-noise ratio for the high-level inputs measured a very excellent 89 dB, while in phono mode the S/N was an equally outstanding 78 dB. These numbers compare favorably with the kind of performance you expect from a separately sold integrated amplifier. Phono overload, however, was only 65 mV; I consider 100 mV at 1 kHz to be the minimum that a phono input stage should be able to handle, what with the wide dynamic range of today's LPs. (One probably ought to substitute a relatively low-output phono cartridge for the high-output model supplied in Pioneer's optional turntable.) The SA-V70's phono frequency response, on the other hand, was excellent, deviating from the standard RIAA curve by no more than 0.2 dB at any point from 30 Hz to 20 kHz.

Action of the bass and treble controls is shown in the 'scope photo of Fig. 1. As you can see, these tone controls are rather rudimentary, in that they use the same center-frequency pivot point. This makes them relatively useless

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If you want to avoid A/V mix-and-match hassles, a total system makes sense, and the price/performance ratio of the SA-V70 is very reasonable.

when you're trying to peak or attenuate frequency extremes (either at the bass or treble end of the spectrum) without affecting mid-frequencies.

Use and Listening Tests

In order to appreciate the SA-V70, you really have to use it with the total audio/video system of which it is a part. I did just that, since Pioneer was kind enough to supply not only the basic elements of the system, but the optional cassette deck, turntable, and TV monitor; the pair of cabinets which house all of these components, and, perhaps best of all, a pair of optional, smaller speakers which enabled me to check out the surround-sound operation of the system.

As you may know, many movie videocassettes are recorded with matrix-encoded sound channels which, when reproduced through an appropriate four-channel audio amplifier/matrix decoder, can rival the spectacular surround sound you hear in suitably equipped theaters. Most films produced with Dolby Stereo, for example, exhibit this effect when properly played back. The surround-sound processor built into the SA-V70 has four modes: "Simulated Stereo" (for use with mono signals), "Expanded Stereo" (for mono signals, or to enhance stereo), and "Theater" and "Stadium" surround modes. These last two modes, which were not designed specifically for Dolby Surround software, require setting the amplifier to its "Surround" (four-channel) mode and hooking up four speakers. The extra pair of speakers can be positioned at the sides of the room, to the right and left of the front speakers, or at the rear of the room. I preferred them behind me, at the rear, and found that I got the most dramatic effect that way. Both the "Simulated" and "Expanded" stereo settings were quite effective with mono signals, particularly the latter, which seemed to add an extra dimension and breadth to reproduced stereo music without spoiling the intended sound image.

As far as the total system is concerned, I was impressed by the simplicity of interconnection. The control links between the SA-V70 and other Foresight system components form a "daisy chain" buss from one component to another, instead of a mess of cables running between each component and the amplifier. I also liked the metallic charcoal-gray finish of the components, which blends nicely with the rosewood of the two equipment cabinets.

For a newcomer to components who wants a total system without the hassle of mixing and matching (or the chance of mismatching), a total audio/video system such as Pioneer's Foresight 77 makes sense. In that context, the price/performance ratio of the SA-V70 master amplifier is very reasonable. If, on the other hand, you are a seasoned audiophile who wants to get involved with video, the "separates" route may still be best for you—providing your pocketbook can support your audio and video taste. *Leonard Feldman*

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5

AZDEN GM-P5L CARTRIDGE

Manufacturer's Specifications
Type: Moving coil.
Stylus: Nude line-contact.
Cantilever: Boron tube.
Frequency Response: 10 Hz to 60 kHz (supplied with calibration curve, 20 Hz to 20 kHz).
Separation: 30 dB at 1 kHz.
Vertical Tracking Force: 1.25 grams, ±0.25 gram.
Dynamic Compliance: 17 × 10^{-6} cm/dyne.
Output: 0.2 mV at 5 cm/S at 1 kHz.
Channel Balance: Within 0.5 dB at 1 kHz.
D.c. Resistance: 10 ohms.
Impedance: 10 ohms at 1 kHz.
Load Resistance: 40 ohms.
Load Capacitance: 100 to 300 pF.
Cartridge Mass: 5.9 grams; 8.8 grams with P-mount adaptor for standard arms.
Vertical Tracking Angle: 20°.
Price: $250; replacement stylus, $125.
Company Address: 147 New Hyde Park Rd., Franklin Square, N.Y. 11010.
For literature, circle No. 94

The GM-P5L is at the top of the line of cartridges offered by Azden. It uses a nude, 0.1-mm-square, line-contact stylus, mounted in a hollow boron-tube cantilever, which is supported by a one-point suspension system. A frequency response extending into the ultrasonic region is claimed, and the one-point support of the cantilever is said to assure excellent image localization. The magnetic circuit is energized by a samarium-cobalt magnet, a material that has a high energy level. The cartridge design uses a cross-shaped armature with a hole through the pole piece for the cantilever. The armature is surrounded with an elastomer, and I was able to observe its entire connection to the cartridge body using a 100× microscope. The stylus appeared accurately mounted to the cantilever, was well polished, and seemed to be properly shaped. The cartridge housing is made of die-cast aluminum. A P-mount design, the GM-P5L is supplied with an adaptor that allows its use in standard arms. It comes in a two-piece plastic container.

Measurements

After measuring an inductance of 0.5 mH and a resistance of 10.5 ohms, I mounted the GM-P5L in a Grace G-747 tonearm on a Denon DP-6000 turntable. The tonearm and cartridge were aligned with the aid of a Telarc Omni-Disc. Measurements were made on both channels to assure accuracy, but only the left channel is reported here unless there was significant variation. During the test period the room temperature was 72° F, ±2°, and the relative humidity ranged from 40 to 60%. The following records were used in making the measurements: CBS STR-100 and STR-112, Deutsches HiFi No. 2, Ortofon 0002, and Shure Brothers TTR-103, TTR-110, TTR-115, and TTR-117.

The tracking force found to be optimum was 1.5 grams, and the optimum anti-skating force was 1.7 grams; settings were made accordingly. For testing, a load resistance of 40 ohms and a load capacitance of 200 pF were used. For some measurements, the output was taken from a Technics SH-305MC transformer which was set for an input resistance of 30 ohms.

The low-frequency arm/cartridge resonance resulted in a 7-dB response rise at a frequency of 9 Hz. The combination of a low 7-dB rise and a desirable resonant frequency allowed the cartridge to track warped records with little problem.

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The GM-P5L's unusually high separation over the whole audio spectrum shows the progress being made in cartridge design.

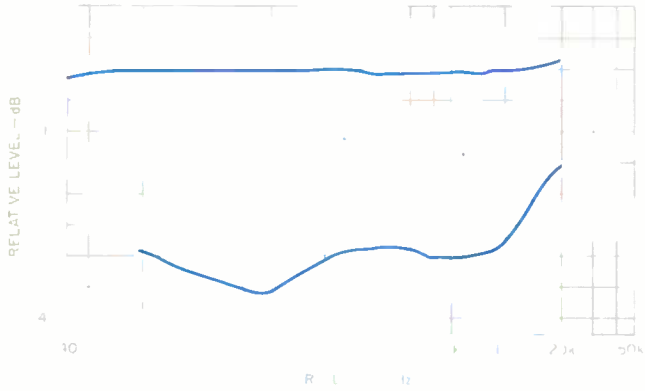

Fig. 1—Frequency response and separation, using CBS STR-100, of Azden GM-P5L cartridge in Grace G-747 tonearm.

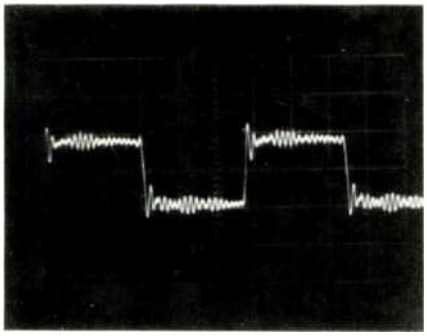

Fig. 2—Cartridge output from 1-kHz square wave, CBS STR-112 test record.

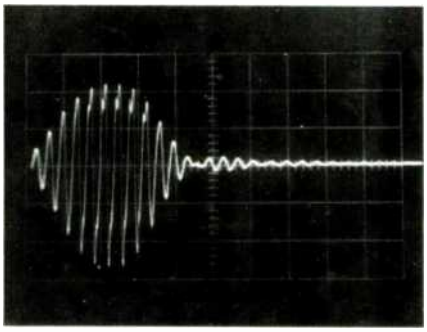

Fig. 3—Output from 10.8-kHz pulse test, at 30 cm/S, Shure TTR-103 test record.

Using the CBS STR-100 test record, the GM-P5L's frequency response (see Fig. 1) was found to be within 3 dB from 40 Hz to 20 kHz. Using the same record, channel separation at midrange frequencies was around 30 dB, reaching a high of 35 dB at 500 Hz. Separation over the entire audio spectrum was unusually high, and illustrates the kind of progress that is being made in cartridge design and construction.

Figure 2 shows the square-wave response obtained with the CBS STR-112 test record. An expanded 'scope trace revealed the rise-time to be 10 μS when the cartridge was connected to the Technics transformer. The single cycle of overshoot and undershoot, followed by low-level ringing, indicates a relatively undamped stylus resonance taking place at about 35 kHz, which is also present on the record as an artifact. The extended high-frequency response of the cartridge is evident from the magnitude of the response in the horizontal parts of the trace.

Figure 3 illustrates the GM-P5L's tracking on the highest level of the 10.8-kHz pulsed sine wave on Shure's TTR-103 test record. It is recorded at a peak velocity of 30 cm/S. Although there is visible distortion present, there is little evidence that the cartridge produced compression or objectionable resonances.

Static vertical compliance was 41 × 10^{-6} cm/dyne. The cartridge's dynamic vertical compliance was found to be 10.2 × 10^{-6} cm/dyne, and its dynamic lateral compliance measured 12.8 × 10^{-6} cm/dyne. The cartridge output was 56 μV/cm/S for the left channel and 52 μV/cm/S for the right. This gives a channel imbalance of 0.6 dB and an output about 3 dB greater than the 200 μV specified.

Using the 3.54-cm/S, 45°, 1-kHz signals from the CBS STR-100 test record, the Azden's total harmonic distortion was found to be 1.5%. IM distortion, using the CBS STR-112 (400/4,000 Hz, 4-to-1), was: Lateral (+9 dB), 0.8% for the left channel, 0.9% for the right; vertical (+6 dB), 4% for the left channel, 3.5% for the right.

The Azden GM-P5L was able to track most of my test records with no distortion visible on my 'scope or audible. It tracked the highest vertical 300-Hz band of the Deutsches HiFi No. 2 test record, which is recorded at 55.4 microns (0.00554 cm) at 10.32 cm/S and 5.86 dB. It was able to track the second-highest horizontal level, which is recorded at 95 microns (0.0095 cm) at 17.90 cm/S and 10.33 dB. Using Shure's TTR-103, it could track band 7 of side one, which is composed of 1,000- and 1,500-Hz signals of equal amplitude, recorded at a peak velocity of 31.5 cm/S. It could do a fair job of tracking band 8 (40 cm/S) of this record if the tracking force was set at 1.75 grams, which is about 17% above the recommended maximum value. There are five levels on Shure's Era IV Obstacle Course, with level five being the hardest to track. The cartridge was able to pass all of the individual instrument tests, level 3 of the harp-and-flute test, and level 5 of the bell-and-flute test. Shure's Era V Obstacle Course has six bands of a complex signal composed of 200 Hz, 2.1 kHz, and 17 kHz. This cartridge was able to track four of those bands without any audible mistracking or visible waveform distortion on the 'scope, and tracked levels five and six with a slight amount of 'scope distortion but no audible distortion. An X/Y plot of monopho-

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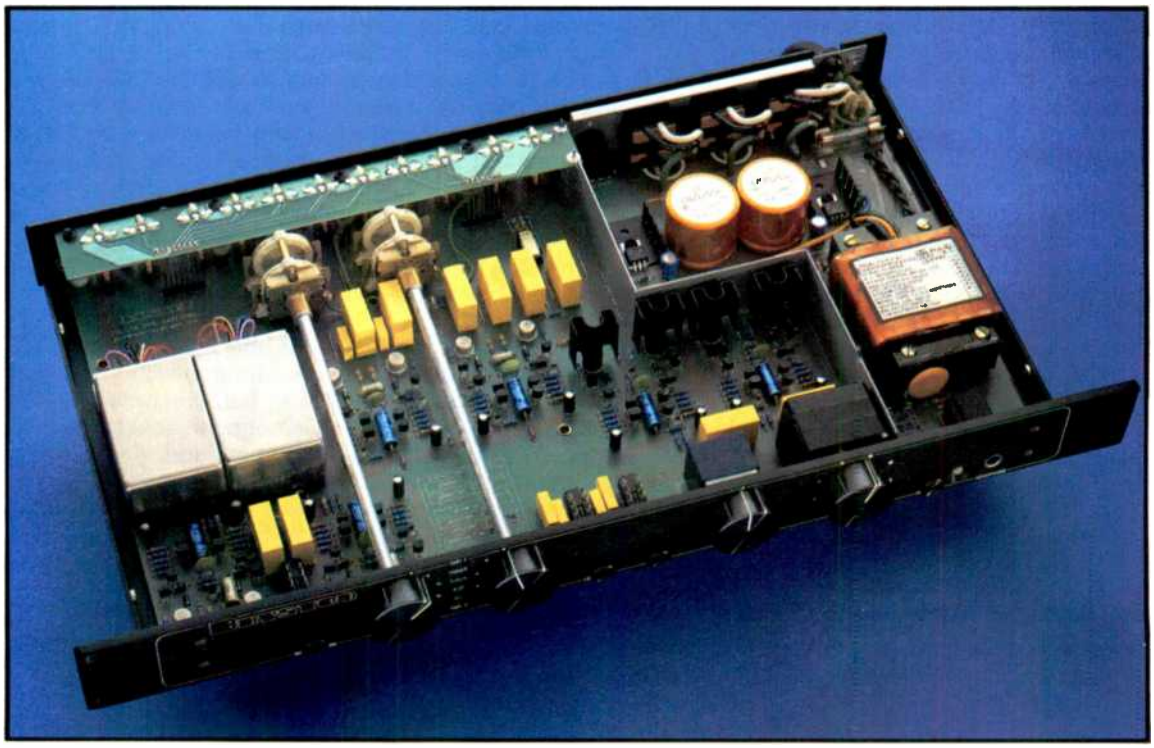

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The Azden offers solid bass, clear and natural midrange, and unrestrained treble; its clarity is impressive.

nic signals from several test records revealed good linearity and phasing between channels.

Use and Listening Tests

The Azden was used to audition several digitally mastered and direct-to-disc recordings, using the same Denon turntable and Grace tonearm which were employed for the measurements. For the listening tests, in addition to the Delos, Mobile Fidelity Sound Lab, and superb Opus records I have used in previous reviews, I employed a recent addition to my collection: The Pro-Use Series, put out by Toshiba-EMI Ltd. These records were made by the direct-cut method and have very little surface noise. Literature accompanying them contains technical information such as microphone placement and other recording data.

The Toshiba-EMI records used were *Super Strings*, Tokyo String Ensemble, Kouichi Sugiyama, conductor (LF-95010); *Sgt. Pepper's Lonely Hearts Club Band*, Jun Fukamachi (LF-95014), and *30 Years in 30 Minutes*, Eiji Kitamura & All Stars (LF-95012). Other records used include: *Beethoven: Piano Sonata No. 23 in F Minor, Op. 57, "Appassionata,"* Ikuyo Kamiya, pianist (RCA RDC-4/JRL 1-1105); *Ravel: String Quartet in F Major, Bartók: String Quartet No. 3*, Sequoia String Quartet (Delos DMS 3004); *Stravinsky: Firebird Suite, Debussy: Afternoon of a Faun*, Los Angeles Philharmonic Orchestra, Erich Leinsdorf, conductor (Sheffield Lab 24); *Chopin: Sonata No. 3 in B Minor, Op. 58*, Steven Gordon, pianist (Reference Recordings RR-5); and *Ragtime Concert*, Nexus (Umbrella UMB DD-2).

As the measurements would suggest, the cartridge performed well during the listening tests, producing a sound that could be characterized as clean and unrestrained. For some reason, possibly because the line-contact stylus was tracing a lot of virgin groove wall, the GM-P5L played many records with less surface noise than did most of my other cartridges. I was especially impressed by the clarity with which it reproduced piano solos and percussive sounds. The GM-P5L's unusually good separation was evident when listening to some of the newer records that use the simpler miking techniques in vogue today. Bass was solid, the midrange clear and natural, and the highs unrestrained. The cartridge was able to track all the commercial discs I tried it with, and most of my test pressings of musical material, with no audible distortion. As mentioned earlier, the well-behaved resonance of this cartridge with the Grace tonearm allows this combination to track records that some of my other combinations have not been able to handle.

This is a state-of-the-art cartridge. Azden has produced an excellent moving-coil cartridge that is worthy of serious consideration by those who are in the market for a new one, and who do not mind the additional considerations that a moving-coil unit entails. *George Shellenberger*

6

NIKKO GAMMA 30 TUNER

Manufacturer's Specifications

FM Section

Usable Sensitivity: 11.2 dBf.
50-dB Quieting Sensitivity: Mono, 14 dBf; stereo, 20 dBf.
S/N Ratio: Mono, 70 dB; stereo, 67 dB.
THD: Mono, 0.15%; stereo, 0.2%.
Frequency Response: 50 Hz to 15 kHz, +1.0, −1.5 dB.
Stereo Separation: 45 dB at 1 kHz, 40 dB at 100 Hz, 35 dB at 10 kHz.
Selectivity: 60 dB.
Capture Ratio: 1.5 dB.
Spurious-Response Rejection: 70 dB.
Image Rejection: 70 dB.
I.f. Rejection: 80 dB.
AM Suppression: 50 dB.
Subcarrier Suppression: 65 dB.
Muting Threshold: 15 to 55 dBf (variable).
Output Level: 550 mV.

AM Section

Usable Sensitivity: 300 μV/m.
Selectivity: 30 dB.
S/N Ratio: 50 dB.
Image Rejection: 30 dB.
I.f. Rejection: 30 dB.
THD: 0.5%.
Output Level: 120 mV.

General Specifications

Power Requirements: 120 V a.c., 60 Hz, 10 watts.
Dimensions: 19 in. W × 2¾ in. H × 11⅞ in. D (48.2 cm × 7 cm × 30 cm).
Weight: 8.8 lbs. (4 kg).
Price: $419.95.
Company Address: 5830 South Triangle Dr., Commerce, Cal. 90040.
For literature, circle No. 95

Visually, the Nikko Gamma 30 tuner is quite attractive, configured as it is for standard 19-inch rack mounting and taking up no more than 2½ inches of panel space if mounted that way. There are seven FM and seven AM presets, and a frequency-synthesized digital tuning system which can be operated automatically (up or down) or manually in 200-kHz increments for FM and 10-kHz increments for AM. These increments make it impractical to use the tuner anywhere but in the U.S.; however, European and multi-voltage units, which tune in 50-kHz increments, are available for use abroad. A blend circuit can be activated when you are confronted with noisy stereo reception, but there is nothing dynamic about this circuit. It simply reduces separation at high frequencies by cross-feeding the two channels through a capacitor, thereby reducing high-frequency noise by cancelling out-of-phase noise components. There is a variable muting threshold, and the signal strength at which muting override occurs can be set over a very wide range.

I would have liked to give you more details about the circuit configuration of this tuner. Unfortunately, however, I don't have a magnifying glass of sufficient power to be able to read the fine print on the schematic diagram which appears in the owner's manual. I did see that discrete devices (including an FET r.f. stage) are used in the FM front-end, while the i.f. section, the AM tuner section, and the FM stereo decoder section consist largely of readily available ICs designed for those specific circuit functions. There was also evidence that several discrete devices are used in the vicinity of the power supply for voltage regulation. A fair amount of circuitry and chassis space is given over to the digital ICs that control the front-panel frequency display and to the display itself. As I was soon to learn, the proximity of the digital ICs and display to the rest of the circuitry proved to be one of this tuner's most serious problems.

Control Layout

The Gamma 30's "Muting Threshold" knob and "Power" on/off switch are at the left end of the front panel. A "Memory" button and seven preset buttons come next; since the latter are activated by a light touch and are not displaced when pushed, an indicator light above each illuminates when that button is touched during preset memorization and selection. Three signal-strength-indicating LEDs are just to the right of the preset lights, and farther to the right are a digital frequency display, the stereo indicator light, and a rocker-type "Down/Up" tuning button (for either manual or automatic tuning). Below the tuning button are AM and FM band-selector switches. At the far right are three more switches to activate the FM blend circuit, to choose stereo or mono, and to select automatic or manual tuning.

The rear panel is equipped with the usual 75-ohm and 300-ohm FM antenna terminals as well as with AM antenna and ground terminals. A separately packed AM loop antenna can be attached to the back of the set by means of a hinge-clamp or can be positioned elsewhere for optimum AM reception. One set of stereo output jacks is provided.

Measurements

Mono usable sensitivity measured a very poor 21.5 dBf, a far cry from the 11.2 dBf claimed by Nikko. The tuner's 50-dB quieting in mono was also far off the mark, measuring 25 dBf against 14 dBf claimed. As for stereo performance, usable sensitivity here was a function of the mono-to-stereo switching level, which measured 26 dBf. The 50-dB quieting in stereo measured 45 dBf, against 20 dBf claimed by Nikko. Harmonic distortion for a 1-kHz modulating signal was equal to the published specification in mono and somewhat better than claimed in stereo, measuring 0.15% and 0.1%, respectively, at input-signal levels of 65 dBf. The best signal-to-noise ratio I could measure in either mono or stereo was 64 dB. The unusually high residual noise was *not*, however, the usual type of random white noise associated with FM reception. Rather, it contained discrete "buzz" frequencies and was present at all times. I suspect that this noise is being generated by some of the digital ICs associated either with the frequency-synthesizing circuit or with the front-panel digital frequency display. Whatever the cause of the noise, it had to be included in my signal-to-noise measurement since it is certainly audible during FM reception of quiet passages of music or speech. It's audible even when strong FM signals are received, confirming that it is an internal problem and is not related to the quieting capabilities of the r.f. or i.f. section. Figure 1 shows how quieting and mid-frequency distortion vary as a function of FM signal strength. Figure 2 shows how harmonic distortion varies with modulating frequencies for strong (65-dBf) input signals. While the Nikko's stereo THD was actually lower than mono THD at mid-frequencies, it rose rapidly at higher modulating frequencies, as might be expected, reaching 0.45% at 6 kHz.

The top trace of Fig. 3 shows the FM stereo frequency response of the Gamma 30. Response was down about 1.5 dB at 50 Hz and at 10 kHz, but there was a slight rise in response above 10 kHz. (This rise is caused, no doubt, by a slight impedance mismatch or a buildup of tolerances in the 19-kHz low-pass filter circuitry that's supposed to attenuate

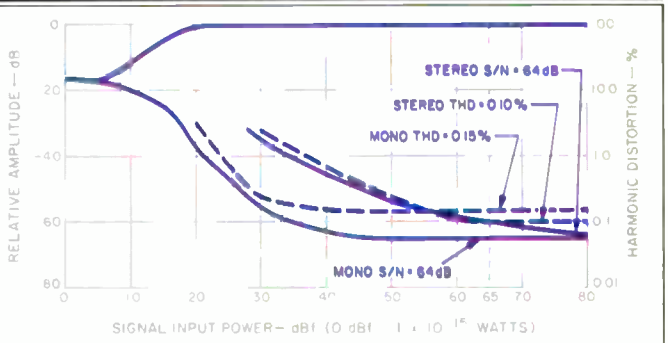

Fig. 1—Mono and sterec quieting and distortion characteristics, FM section.

The positive attributes of the Gamma 30 cannot offset the fact that it was not very sensitive.

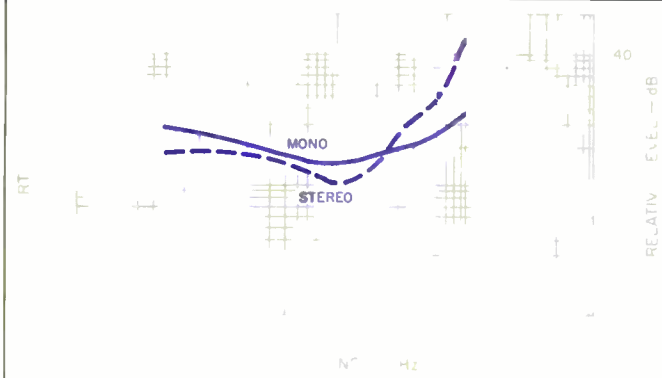

Fig. 2—THD vs. frequency, FM section.

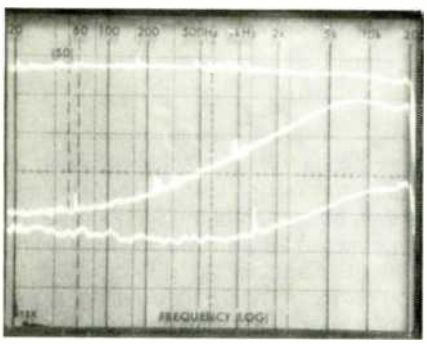

Fig. 3—FM frequency response (top trace), and separation vs. frequency with blend circuit switched in (middle trace) and without blend (bottom trace).

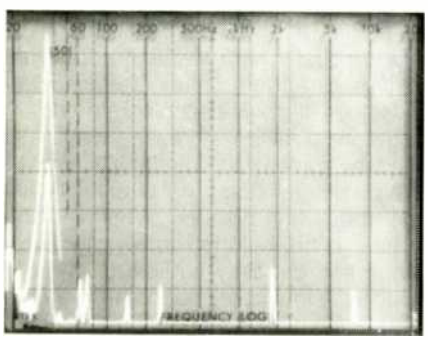

Fig. 4—Crosstalk and distortion products resulting from 5-kHz modulation in one channel. (Vertical scale: 10 dB/div.)

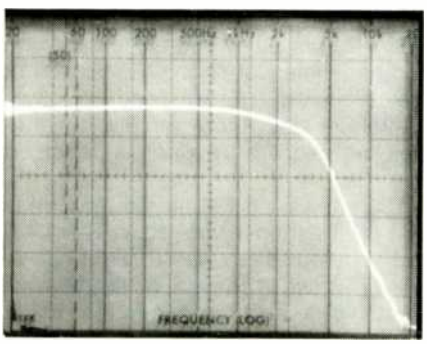

Fig. 5—Frequency response, AM section.

the 19-kHz pilot carrier frequency during stereo reception.) The middle trace shows separation with the high-blend circuit activated. The bottom trace shows the full FM stereo separation characteristic, from 20 Hz to above 15 kHz. At mid-frequencies, separation measured 42 dB from the left channel to the right and 45 dB from the right channel to the left. At 100 Hz, separation was 44 dB (left to right) and 46 dB (right to left); at 10 kHz, separation measured 29 dB in both directions.

Figure 4 shows the available separation for a 5-kHz modulating signal—the difference in height between the two spikes at the left of the display; the vertical scale is 10 dB/division. It also shows the crosstalk components that appear at the output of the unmodulated channel. Second- and third-harmonic components of the 5-kHz modulating signal on the opposite channel are visible in the oscilloscope photo, as are 19- and 38-kHz subcarrier components located farther to the right.

Because of the high degree of residual noise in the output of this tuner at any signal level, it was not possible to obtain accurate measurements of spurious, image, and i.f. rejection ratios. AM suppression measured very close to the 50 dB claimed, alternate-channel selectivity was 62 dB, and capture ratio was approximately 2.0 dB.

Surprisingly, the AM tuner section actually came closer to meeting its published specifications than did the FM section. AM frequency response, shown in Fig. 5, was reasonably flat to around 3.0 kHz, and signal-to-noise ratio for a strong AM signal measured 50 dB, as claimed. THD at 1 kHz measured 0.45%, and usable sensitivity was a shade better than the 300 μV/m claimed by Nikko.

Use and Listening Tests

The Gamma 30 is certainly easy enough to use. Both manual and automatic tuning modes performed as they should have, with the wide range of the muting control serving to limit the number of stations at which the automatic tuning would stop. Despite the less than optimal r.f. alignment in this sample, the i.f. section and the FM detector were well aligned, so that when my FM generator and the tuner display showed the same frequency, distortion was at its lowest point for that signal. This has not always been the case with frequency-synthesized tuners. I've tested many that yield lowest distortion when my generator is offset 10, 20, or in some cases even 40 to 50 kHz from the nominal frequency shown on the tuner's display. This type of misalignment was not in evidence on the Nikko sample, so that with strong incoming broadcast signals I did get inaudibly low distortion levels.

The positive attributes, however, cannot offset the fact that the tuner was not very sensitive (poor r.f. alignment). Nor can they offset the insufficient shielding of the signal circuits from the digital display and other noise-producing circuits, which caused that ever-present noise at 64 dB below full modulation. It is, of course, possible that this phenomenon was present only in the sample I tested, though I don't believe so. The Gamma 30 will certainly do for casual FM or AM listening, but I find it difficult to recommend to those seeking state-of-the-art FM reception.

Leonard Feldman

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246868. Jim Croce—Photographs And Memories—His Greatest Hits. *Time In A Bottle*; etc. (Saja)

343822. Prince And The Revolution—Parade. Music from "Under the Cherry Moon." (Paisley Park)

349530. The Monkees—Then And Now...The Best Of The Monkees. Includes the new hit: *That Was Then, This Is Now*; etc. (Arista)

346205. Belinda Carlisle—Belinda. Includes *Mad About You*, many more. (I.R.S.)

286914. Fleetwood Mac—Rumours, #1 Hit Album. Includes *Don't Stop, You Make Loving Fun*; more. (Warner Bros.)

348706. Wynton Marsalis—J Moods. *Much Later; Melodique*; more. (Digital—Columbia)

347245. Spyro Gyra—Breakout. *Freefall*; etc. (MCA)

346270. Wham! Music From The Edge Of Heaven. I'm Your Man; more. (Columbia)

345777. Peter Gabriel—So. Includes *Sledgehammer; In Your Eyes*; more! (Geffen)

344812. Billy Ocean—Love Zone. #1 album & hits. Includes *Love Zone*; more. (Jive/Arista)

347054. David Lee Roth—Eat 'Em And Smile. (Warner Bros.)

334391. Whitney Houston—Whitney Houston. *Greatest Love Of All*; etc. (Arista)

347492. Glenn Miller Orchestra—In The Digital Mood. New! Includes Miller—Big Band hits: *In The Mood; Tuxedo Junction*; more. (Digital—GRP)

333286. Phil Collins—No Jacket Required. Album of the Year! (Atlantic)

339200. Stevie Wonder—In Square Circle. #1 album. (Tamla).

343319. Janet Jackson—Control. #1 album. *What Have You Done For Me Lately*; more! (A&M)

318089. Michael Jackson—Thriller. *Billy Jean*; etc. (Epic)

320499. The Police—Synchronicity. Winner of 3 Grammy Awards! (A&M)

314443. Neil Diamond's 12 Greatest Hits, Vol. 2. *You Don't Bring Me Flowers* (with Barbra Streisand); etc. (Columbia)

219477. Simon & Garfunkel's Greatest Hits. *El Condor Pasa*; etc. (Columbia)

308049. Creedence Clearwater Revival Featuring John Fogerty/Chronicle. Greatest hits. (Fantasy)

343582. Van Halen—5150. (Warner Bros.)

339226. Gershwin: Rhapsody In Blue; Second Rhapsody; etc. —M. Tilson Thomas, Los Angeles Phil. (Digital—CBS Masterworks)

336222. Dire Straits—Brothers In Arms. A #1 album! *Money For Nothing*, others. (Warner Bros.)

345553. Branford Marsalis—Romance for Saxophone. Top 10! English Chamber Orchestra (Digital—CBS Masterworks)

343947. Tony Bennett—The Art Of Excellence. Includes—*Everybody Has the Blues* (duet with Ray Charles); more. (Digital—Columbia)

343327. Wynton Marsalis—Jolivet/Tomasi: Trumpet Concertos. Philharmonia Orchestra. (Digital—CBS Masterworks)

336396-396390. Billy Joel's Greatest Hits, Volumes 1 & 2. (Counts as 2—Columbia)

337519. Heart. Top 10 Album. *What About Love; Never*; etc. (Capitol)

345827. Bob James and David Sanborn—Double Vision. Joined by Al Jarreau, others. Includes *Since I Fell For You*. (Warner Bros.)

341305. Robert Palmer—Riptide. *Addicted to Love*; more. (Island)

288670. Barry Manilow—Greatest Hits. *It's a Miracle; Mandy*; etc. (Arista)

343095. Philip Glass—Songs From Liquid Days. Lyrics by Paul Simon; David Byrne; etc. Featuring Linda Ronstadt. (CBS)

321380. Barbra Streisand's Greatest Hits, Vol. II. Includes—*The Way We Were*; more! (Columbia)

323261. Lionel Richie—Can't Slow Down. *All Night Long*; etc. (Motown)

340323. Sade—Promise. #1 Smash. (Portrait)

326629. Bruce Springsteen—Born In the U.S.A. (Columbia)

342097. Barbra Streisand—The Broadway Album. *Somewhere; Something's Coming*; more. (Columbia)

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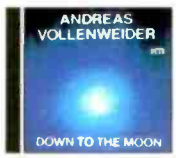

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VPI HW 19-MKII TURNTABLE

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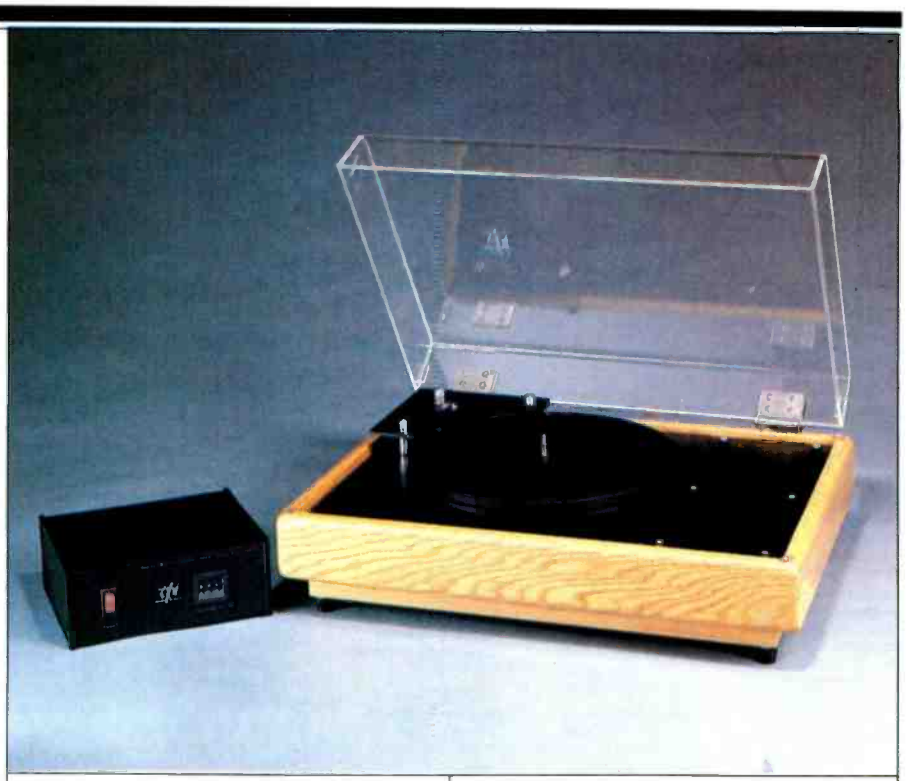

Anyone who regards high-end audio as a seat of cultism probably finds it difficult to understand why so many audiophiles still place so much emphasis on assembling the best phono front-end rather than getting the best Compact Disc player. Audiophiles who put technical specifications before actual sound may also find this difficult to understand, since, in terms of virtually all technical tests, the cheapest CD player wins hands down over the best phono front-end.

Further, it is possible to buy, for less than $200, Japanese direct-drive turntables that have superb wow, flutter, and rumble performance and come complete with arm and full automation. Test results of some low-priced turntables may approach or even surpass those of some turntables costing over $1,000. The inexpensive models may also offer more operating convenience, with features such as automated track selection and remote control.

The phono connoisseur's response is threefold: First, the issue just isn't as simple as the CD player versus the turntable, it is also one of the availability of music. Fifty years, more or less, of analog discs are available, while (with the exception of a few classic performances) CDs offer only what has been pressed in the last three years. What's more, many CDs are already unavailable because their initial pressings have been sold out.

Second, some audiophiles who can afford both top-ranking CD players and the best phono systems feel that the latter still sound more musically natural and exciting. Good as today's best CD players are, the audiophile who can afford to spend more than $1,000 for a CD player and another grand for a turntable system very often comes to prefer the turntable. So my experience runs.

Finally, most folks who give a serious listen to the top-grade turntables (equipped with a suitable arm and cartridge) from such companies as Goldmund, Oracle, Merrill, Linn, SOTA, or VPI find that they sound far, far better than the competition priced at the rock bottom. Even if the bargain-basement turntables do offer myriad automatic niceties, true high-enders so rarely skip tracks that saving a few moments of manual operation is scarcely worth the loss of sonic performance. Indeed, serious high-end listeners draw the same conclusions about the moderate-priced turntables from, for example, Acoustic Research, Ariston, Dual, Rega, Sonographe, Systemdek, and Thorens. Which is to say that these turntables, costing but a few hundred dollars, offer an extremely important alternative to both the "break the bank" turntable and any CD player. Such turntables, including tonearm and phono cartridge, offer the high-end audiophile with less than a Monte Carlo budget truly good sonic performance at price points anywhere from $200 on up to $800 or so.

The VPI HW 19-MKII is a good case study in the advantages of a quality turntable. It is a fully mature design, the result of years of painstaking development. While it is not cheap—it costs $885 without any frills or accessories—I have heard only one turntable at any price that is clearly sonically superior, the improved SOTA Star Sapphire with the new Vacuum Acrylic Supermat and Electronic Flywheel—and this combination costs more than twice as much as the VPI. Good as other leading competitors may be, they do not clearly outclass the VPI HW 19-MKII, and one of them costs 15 times as much!

This makes the HW 19-MKII as good a test as any of what a top-quality turntable can do. In a really good system and with top-quality records, you can hear the air, sweetness, low-level harmonic detail, and natural sound stage that many audiophiles feel is missing from most CD players and most CDs. You also will hear just how close a good turntable can come to equalling the speed and pitch stability, accuracy of timbre, and background quietness that are the strengths of the CD player. A few hours of actually listening to music of the same performance on both CD and analog record may well resolve any uncertainties about the two technologies and the conflicting views of various reviewers. After all, it is your ears and your taste in music that count.

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Boston Acoustics

In a top-quality system, the HW 19-MKII provides the air, sweetness, detail, and natural sound stage that many audiophiles feel is missing from CDs.

An especial strength of the HW 19-MKII, relative to its mid-priced competition, is that it does not produce background noise. In fact, records seem to have less background noise on the MKII than on the most expensive turntables. The HW 19-MKII is also very dynamic. Many competing turntables seem to slightly dull the music; this gives more apparent prominence to turntable and phono noise and heightens the gap between the dynamic range of most records and that of the best Compact Discs. If you have not listened to a top-quality turntable before, you may be surprised to hear how "live" the HW 19-MKII sounds, compared to most turntables, and how much of the noise you take for granted as being inherent on records seems to disappear.

The HW 19-MKII is also superior to most turntables in that it does not emphasize or recess any part of the frequency spectrum in terms of overall timbre or low-level musical dynamics. Most British turntables, for example, produce an apparent loss of lower bass information, and many American and Japanese turntables seem to emphasize either the upper mid-bass or the upper midrange portion of the musical spectrum.

The HW 19-MKII provides as much musical information for the full range of instruments and voice as any turntable I have ever had the opportunity to audition, and it does so in a musically natural way for all frequencies. It produces clean, very low bass and natural overtones, and upper harmonics with no loss of air. Best of all, the MKII does not favor one kind of music over another. It doesn't matter if you like rock, chamber music, Mahler, or a good jazz singer, the HW 19-MKII is both transparent and musically coherent for all types of material.

Construction and Features

The HW 19-MKII is very well styled. It comes in oak, walnut, or wood-and-formica finishes at its standard price of $885, in piano black for $100 more, and with an acrylic top plate for an additional $115. The standard dust cover is much more solid than that of many other designs, and an optional tall dust cover to fit the larger or more exotic tonearms is available for $40.

The HW 19-MKII has an improved, heavy-duty, a.c. synchronous motor which is quieter than the one used in the HW 19. Unlike some turntables, the MKII has enough torque to ignore groove stiction and stylus drag problems—which seem to be part of the reason why many direct-drive and low-torque belt-drive turntables do not live up to the promise of their specifications. The HW 19-MKII provides consistent pitch and musical stability over the entire length of the record, and from record to record. There are none of the low-level problems with long-term speed and pitch consistency common in many lower priced units.

The platter is machined from a block of 1-inch-thick acrylic with a 6-pound ring of lead on the bottom. VPI claims that this is equivalent to a 20-pound aluminum platter. In my opinon, the VPI now does seem to have the stability and immunity to acoustic breakthrough of the most expensive two-piece Micro Seiki turntables, without their problems of sensitivity to furniture movement and vibration. The platter has also been improved, as has the belt. The grooves for the belt in the side of the platter have been eliminated; the new unit seems to run slightly more steadily and no longer has any problems with motor/platter height alignment.

Equally important, the VPI platter has a hard plastic surface similar to that of a record. Clamping a record to such a platter without any kind of intervening mat seems to do the best possible job of getting all of the music from the record, with the least possible coloration in terms of resonance and noise. (Goldmund and SOTA also use variations of this design technique.) The clamping system in the HW 19-MKII also works exceptionally well. A hard plastic clamp, recessed in the center, screws down over the threaded spindle onto the record, and a thin, slightly cone-shaped, hard-rubber washer fits underneath the record. The end result is that the clamp locks the record down evenly over the platter, producing a very flat playing surface without any "hills and valleys" or air pockets under the record. This clamping system is surpassed only by the vacuum system in the SOTA Star Sapphire. In fact, the VPI seems to do a slightly better job of coupling the record, in a way which damps external resonance while retaining musical data, than the Goldmund, Oracle, and regular SOTA Sapphire—all of which do a far better job of coupling the record than virtually all of their competition.

It has been years since I did any metalwork on a lathe, but I still remember enough to assert that the machining on the HW 19-MKII is equal to the best competition, and is, again, far superior to most mass-produced units. The bearing is sintered bronze at the top and bottom of the aluminum housing, with a chrome-hardened ball resting on tungsten carbide at the bottom.

I can't say whether this combination of platter, spindle shaft, and bearing is better or worse than competing bearing systems, but the VPI platter will freely rotate for an exceptionally long time. There is no audible hint of wow, flutter, or rumble—all of which are normally faintly discernible on a long-term basis in most competing turntables. You can adjust the HW 19-MKII's bearing and platter height from the bottom of the shaft well, using a screwdriver. This requires you to raise the turntable, but it can be a real boon when you want to make very fine VTA/SRA adjustments and are using one of the many top-quality tonearms whose height is difficult to change.

The VPI's suspension has been improved to the point where it requires only minimal adjustment to suit a given tonearm, but it is remarkably free of sensitivity to either acoustic or furniture vibration. The HW 19-MKII has a massive, 36-pound floating chassis made of two layers of 10-gauge steel, bent and welded together with a Sorbothane damping layer underneath. This floats on four springs, one at each corner, which are coupled to the chassis by point contacts similar to The Mod Squad's Tiptoes.

The frequency of the suspension is set at about 3.5 Hz. VPI claims this makes the MKII exceptionally resistant to building vibration, subsonic air-conditioning noise, and a lot of other problems. Only the SOTAs seem to be more immune to room and furniture vibrations. As for the undercabinet, it is a well-braced unit with ¾-inch sides. The HW 19-MKII is amazingly solid.

In short, I would rank the HW 19-MKII as the high end's best buy in top-

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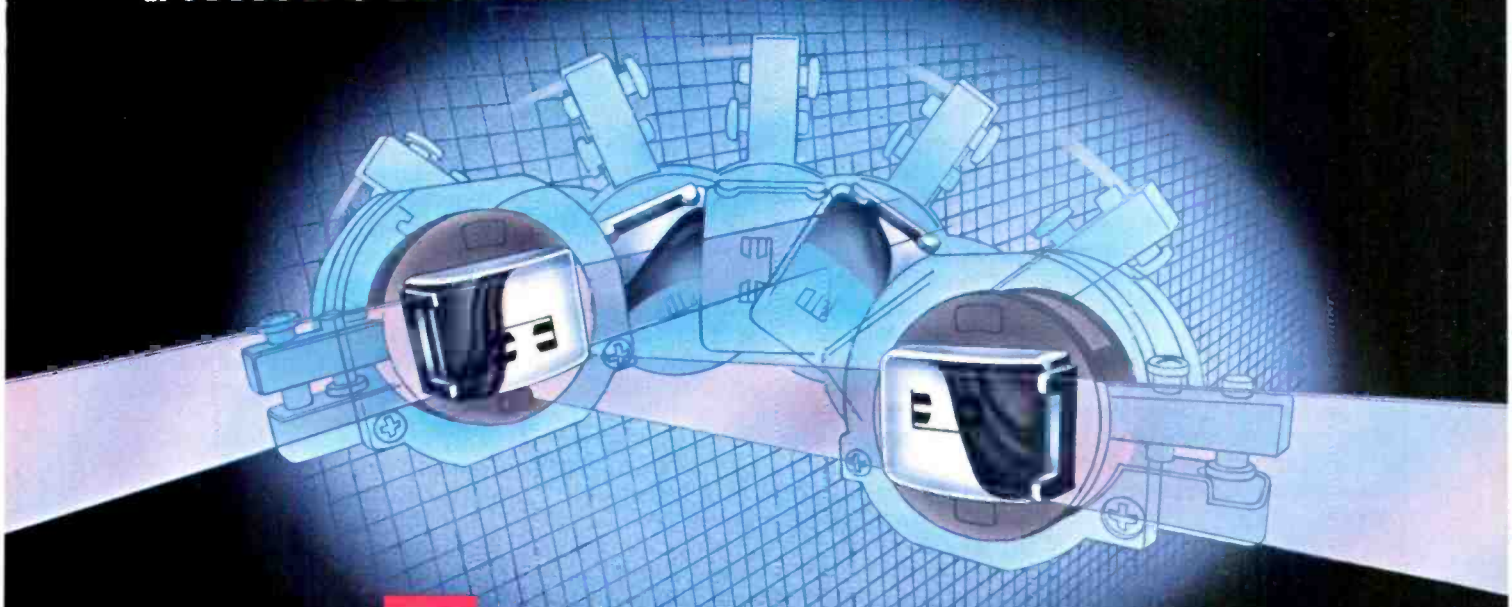

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quality turntables. It can take virtually any arm with a minimum of difficulty, and it is built well enough to run for years without trouble. This is the kind of component you can buy without any fear that tomorrow's new turntable design will be all that dramatically better.

Getting the Best Performance

Given this praise, the issue becomes one of how to get the best out of the HW 19-MKII in an entire turntable/tonearm/cartridge system. Good as the turntable is, you must choose an arm and cartridge of equal quality to get the benefits. In fact, finding the right cartridge/tonearm interface is one of the most important tasks your dealer can perform. It involves too many variables for a reviewer to provide the proper range of advice, although I can make several suggestions that may be helpful.

First, if you really cannot afford a top-quality tonearm and cartridge, don't buy the HW 19-MKII. "Top quality," however, does not have to mean unaffordable. Some of the best high-end cartridges may have somewhat unfamiliar names, but they also do not cost $1,000 and many can be had for less than $325. Some examples include Music & Sound's Econocoil, the Grado Signature 8MX, the AudioQuest AQ 404, the Adcom XC-MR II, and the Ortofon MC 20. As for tonearms, you can get good performance for $200 to $300, and even the *crème de la crème* is priced below $900, affordable to some. Spanning this price range are the Souther Junior, the Premier FT-3 (available through Sumiko), the Well Tempered, Eminent Technology's Model Two, and the Dynavector DV-507. These last two will do the most to get the very best performance out of the HW 19-MKII.

The important thing is to be sure that the compliance and other characteristics of the cartridge you pick match the mass of the tonearm, and that the end result blends together as a system on the VPI HW 19-MKII. You can ask your dealer to demonstrate that his recommendation produces decent results on tracking and square-wave test records, but you should also carefully listen to the assembled system, preferably at the store, before you finalize the purchase.

The tonearm mounting can be critical. The HW 19-MKII normally has a wood tonearm-mounting board, but you can buy a predrilled acrylic board for a bit more. Metal tonearm mounting plates work well with some turntables—for example, the SOTA—but with the MKII they tend to give you life and energy at the expense of hardness, a bit more resonance or noise, and exaggerated dynamics.

In either case, I would recommend getting a predrilled board directly from the manufacturer, rather than buying one from the dealer or trying to drill one yourself. VPI, like most top-quality manufacturers, tests lots of tonearms and setup instructions. Therefore, arms mounted in their boards will often be set up more accurately than even those set up by dealers who fully follow the arm manufacturer's instructions.

Also, The Mod Squad sells tapped Tiptoes which can replace the feet on the HW 19-MKII. These add an additional level of decoupling between the turntable and the furniture on which it is placed. The Tiptoes work better in reducing acoustic feedback than any of the special turntable mounting boards I've tried to date, and they are considerably less unsightly.

The VPI Powerline Conditioner

If you live in an area with power-line frequency or voltage problems, if you have perfect pitch, or if you have a collection of old 78-rpm records, you should consider the VPI Powerline Conditioner. This costs another $300, but it will eliminate transient voltage variations. The Powerline Conditioner provides a stable, 125-V output with voltage inputs from 70 to 140 V, and it has front-panel frequency controls which will vary the output frequency from 50 to 99.9 Hz, within 0.02%, for a turntable speed range of about 26 to 100 Hz.

This may not sound particularly important, and in most homes it may not be. If you own a personal computer, however, you probably already have discovered how bad a standard power line can be. In my home, the Powerline Conditioner did as well as $1,000 worth of computer a.c. line filtering and power regulation, and—under worst-case local a.c. line conditions—notably cleaned up the sound.

Turntable Placement

Finally, placement of a phono system is often as important as placement of loudspeakers, particularly when you are building a true high-end system. While the HW 19-MKII is relatively immune to acoustic breakthrough and other resonances, these effects will vary from room to room and according to the room's furniture. I have heard minor improvements from moving the VPI a few inches on a cabinet surface, and keeping one's turntable out of a room-effect area is simply common sense. Try two or three locations and see if you can hear a difference. If you can't, the chances are that your listening room or present system location is adequate.

Committing to a High-End Turntable

If some of this advice seems a little unusual in a turntable review, it is included because I've become increasingly conscious that many dealers are turning away from high-end phono systems, and many buyers are now deciding whether to continue collecting analog records or to switch to Compact Discs. A good part of the mail I receive deals directly or indirectly with CD versus phono, and all too much of it reflects the fact that either the reader has never really heard a top-quality turntable/tonearm/cartridge combination or has been unable to get the advice needed to buy one in a properly set-up form.

This is a critical reason you should listen in depth to the HW 19-MKII and your choice of cartridge and arm before you buy. Your total phono system, with the VPI, will cost at least $1,500 and possibly over $2,000. At these prices, your dealer should be able to demonstrate that you can get a system that equals or surpasses Compact Disc. My guess is that a really good dealer will have spent a long time getting good combinations together, and you will not have to rely on the word of a reviewer or worry about the theories or technical claims of pundits or manufacturers. I would also guess that with a little patience, you may be amazed at just how much extra musical pleasure you will experience when you listen to a turntable as good as the HW 19-MKII.

Anthony H. Cordesman

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Illustration: Rick Tulka

Rodgers and Hammerstein: South Pacific. Kiri Te Kanawa, José Carreras, Mandy Patinkin, and Sarah Vaughan.
CBS MK 42205.

It opened on April 7, 1949 and ran for 1,925 performances. It won the Pulitzer Prize, the New York Drama Critics Circle Award, and six Tonys. And unless you were living on Mars you knew that tickets to *South Pacific* were the most desirable thing in New York. To remember just how fine a work of the musical theater it is, however, you have to listen to the original cast recording or even watch the 1958 film version. This Compact Disc is stunningly produced and musically lush, but the performances are simply too uneven to do more than suggest the brilliance of *South Pacific*.

Cheers for Kiri Te Kanawa, first of all. She doesn't try to reprise Mary Martin, and she leaves aside her impressive operatic gifts to serve the role of Ensign Nellie Forbush. From "Cockeyed Optimist" to "I'm in Love with a Wonderful Guy," Dame Kiri lets her breathy zest convey hesitation, self-doubt, cheery hope. Her cadenzas are not gratuitous vocal flourishes; they make real the girl from Little Rock. You can almost see her wrinkled brow in "Twin Soliloquies" as calmness is undone by fear, and in "Honey Bun" it's easy to imagine just how good she'd be in person, doing a number that's almost vaudeville. (When she sings "I'm a little hick," she slaps that final "k" to a fare-thee-well; it's absolutely the right touch.)

Mandy Patinkin, whose singing of "Younger than Springtime" may be the hardest assignment of all, brings a lucid, callow confidence buttressed by a rare combination of intensity and control. He makes his final note heartbreaking, not easy to do in falsetto.

Alas, this disc suffers dreadfully because of José Carreras and Sarah Vaughan. Carreras declaims, without passion or depth, and "Some Enchanted Evening" comes out like a TV crooner with shockingly poor diction: "Some enchanta teevning," he snaps, and there is terrible trouble with his final r's: ". . . when you find you true love . . . make her you own . . ." and so on. It's like a bad satire of a Neapolitan fisherman. And Sarah Vaughan mistakenly has the impression that Bloody Mary is a torchy nightclub singer, all smoky and bluesy and affected, rather than a seductive, calculating madam. She also has an annoying habit of adding consonants that aren't there: "Your own shpecial hopes . . . shpecial dreams . . ." Sorry, Vaughan fans, your beloved is no Bloody Mary.

This is an important disc, reservations aside. The music is quite simply sublime, and conductor Jonathan Tunick has rendered the score splendidly. The orchestrations (Tunick's additions to the Robert Russell Bennett originals) are invariably rich, supportive, contrapuntal and provocative, and the production values are superb. Listen, savor, follow the score (not provided) and the lyrics (provided). Then pull out your old Columbia 78s and revel in Mary Martin, Ezio Pinza, Juanita Hall, William Tabbert. Those, as they say, were the days. *Donald Spoto*

Debussy: Suite Bergamasque, Children's Corner, Estampes. Alexis Weissenberg, piano.
Deutsche Grammophon 415 510-2.

There is a very fine all-digital sound on this recording. The piano is as most of us would want to hear it, from superpianissimo to ultra-loud, and neither too hard nor too mellow in tone. There is also the enormous advantage, in the low-level parts and in the die-away of strings, of *no* pitch waver. In this respect the CD is matched only by live performance. You won't notice the micro-wavers on most good recordings, LP or cassette. But when they are removed—*then* you notice.

It is this absolute lack of waver, along with the total absence of any rhythmic turning or pulsing, that is, in my opinion, the greatest asset of the CD format. You can simply float smoothly in time, rather than subconsciously counting those faint round-and-round rhythms that so relentlessly mark off the passing seconds. On the bottom there is nothing, except music. And maybe a few passing buses and helicopters.

So much for sound. I am sorry to say that this powerful piano virtuoso, of a sort that thunders loud and long and has dazzling finger play (grandly blurred by the ever-present foot ped-

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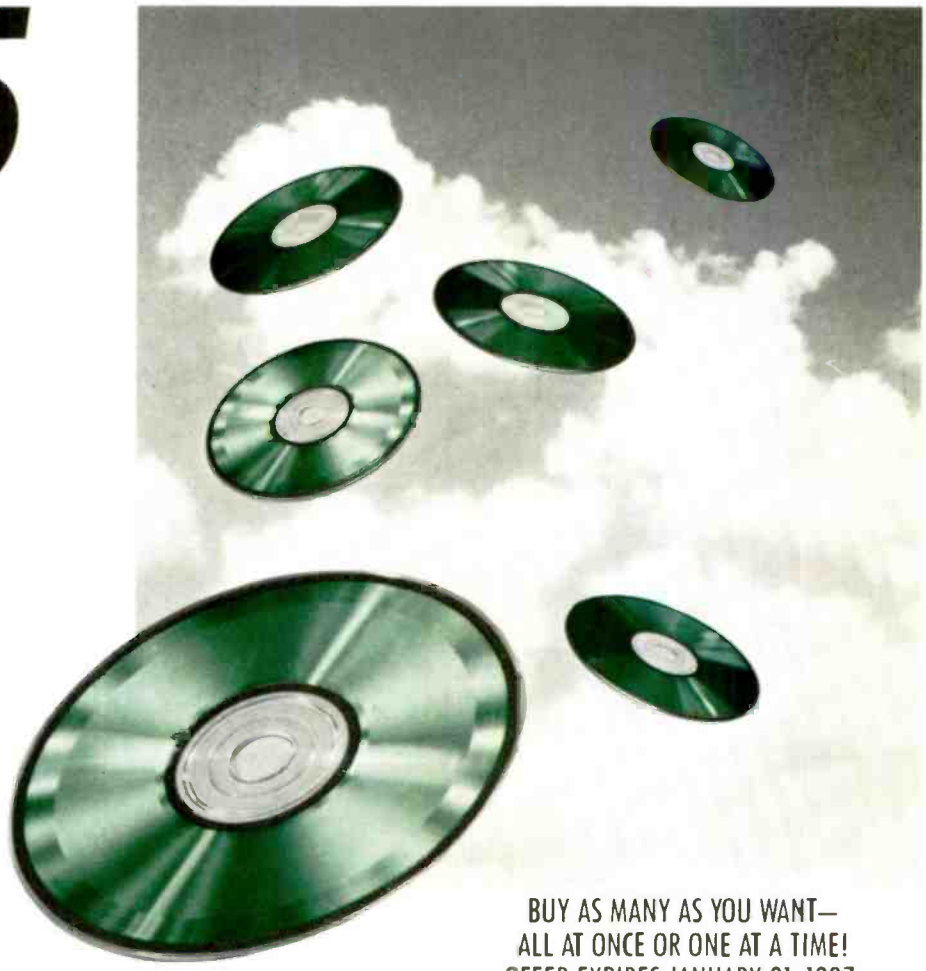

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LUTHER VANDROSS **"Give Me The Reason"**

BRANFORD MARSALIS **"Royal Garden Blues"**
PAUL YOUNG **"Between Two Fires"**
DEAD OR ALIVE **"Mad, Bad And Dangerous To Know"**
THE ROLLING STONES **"Sticky Fingers"**
ANDREAS VOLLENWEIDER **"Down To The Moon"**

RODGERS & HAMMERSTEIN: **"South Pacific"** Te Kanawo, Carreras, Vaughan, Patinkin; Ambrosian Singers; London Symphony Orch./Tunick
BEETHOVEN: **Symphony No. 9** New York Philharmonic/Bernstein

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Haydn wrote the lightest, fleetest music imaginable, and Yo-Yo Ma plays it in perfect harmony with the orchestra. A definitive recording, if you ask me.

al), is a player who kills Debussy as often as he brings him to life. Who can say exactly why? He plays the notes. But anyone who has heard this master's music over the years knows how very precise and exacting it must be in detail, and how *French*.

I have heard three great Debussy performers in my day, two of whom were approved by Debussy himself—Maggie Teyte, the singer (originally Tate, from England); George Copeland, a retiring but tremendous American pianist, and later Walter Gieseking, a pianist whose playing of Debussy was out of this world. None were French, so we can't count Alexis at fault on that score! But his Debussy is no fine-tuned racing car; it is more like a fine-tuned war tank. Brilliant, exciting, but not Debussy. Perhaps Rachmaninoff in Debussy's clothes.

Edward Tatnall Canby

Haydn: Cello Concerti Nos. 1 and 2.
The English Chamber Orchestra, José-Luis Garcia; Yo-Yo Ma, cello.
CBS MK 36674.

Yo-Yo Ma, the smiling young man with the unusual name and the fabulous technique, has rather thoroughly changed our idea of the cello soloist, single-handedly, even though there are hundreds of other top-rated cellists around, and literally thousands more who are highly competent. Changed it from what to what? From our idea about the solo tenor-voiced instrument, popular over the past 150 years, back to Haydn's late 18th-century concept of a bass- or baritone-voiced instrument. That's what we have here, in the performance and, luckily, in the recording as well. They match each other to perfection.

The older cello, live, of course, somehow became an almost lugubrious soloist in the 19th century, beginning as far back as Beethoven—its high-tenor upper tones sang woefully and beautifully (and usually out of tune); its lower notes and especially its chords, the double stops and arpeggios, took on an elephantine sonority that went well with 19th-century ideas of big music and deep expression. When recording came along, we picked up this idea with a vengeance. The cello became huge, a sort of doubled double bass, large enough to shake the speaker cabinets and rattle the plates on your table. Most earlier cello records place the instrument, with bass grossly emphasized, about two feet away from your ear. A faint, almost inaudible accompaniment is heard somewhere in the background. It was a useful effect and very popular, obviously, even if it sometimes sounded like a dull saw.

Now listen to Yo-Yo—and Haydn! Haydn wrote the lightest, fleetest music imaginable for his soloist, whether sweetly singing or dashing along in fast notes. Yo-Yo plays it that way—never a groan or a bass grunt, and *never* out of tune. I grew up to think that cellos, like opera singers, always were out of tune. So they were, by long custom!

Now a few words about the recording, and the accompaniment, which is far more than an accompaniment, being a full-fledged orchestra in both works. These players are superb; they really complement the solo parts, as indeed they should (but usually didn't in earlier recordings). And the engineers have caught the idea exactly. Yo-Yo is always audible, but he is *in* the orchestra, surrounded by it, playing as a live cellist must play, in perfect harmony with the sound of the other instruments. A definitive recording, if you ask me, and maybe something of a revolution in cello, as well.

Edward Tatnall Canby

Schumann/Grieg: Piano Concertos.
The London Symphony Orchestra, André Previn; Radu Lupu, piano.
London 414 232-2.

This is a prime example of the musical treasures that are buried in the vaults of the record companies. When this recording of the popular Schumann and Grieg piano concertos was made in 1973, it was done under the most favorable of circumstances. Professional Dolby A recording technology had been well established for seven years, and, with the analog tape recorders of that era, master tapes with full-spectrum frequency response, good signal-to-noise ratio, and wide dynamic range could be made.

Recorded in the flattering acoustics of London's Kingsway Hall, the superb sound can be credited to the skills of one of Decca's greatest recording engineers, the legendary Kenneth Wilkinson. He has provided these concertos with a rich, opulent sound that has a

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With her ardor, accuracy and quicksilver touch, Alicia De Larrocha plays Spanish piano music like nobody else. After all, it's in her blood!

very natural balance between piano and orchestra.

Pianist Radu Lupu has not performed often in this country, so his enormously skilled playing is not very well known. His performances of these works are characterized by a masterful handling of dynamics coupled with a very expressive evocation of the music's lyrical qualities. One of the most attractive things about Lupu's playing is his incredibly clean touch—every note is completely articulate without the slightest blurring. With Previn's warmly sympathetic accompaniment and the superb playing of the London Symphony Orchestra, we have music-making of the highest order.

This recording obviously proves the Decca engineers' skill at transferring analog tape masters to the digital format. It is interesting to note that if an engineer made a direct analog copy of the master tape for you, it would be degraded by incremental tape noise and other problems. Such degradations do not occur when transferring analog tape to the digital medium. Thus, in a sense, when you listen to this CD, it is the equivalent of listening to the original master tape. *Bert Whyte*

Granados: Seis Piezas Sobre Cantos Populares Españoles. Alicia De Larrocha, piano.
London 410 288-2.

No one plays piano music in the Spanish idiom quite like Alicia De Larrocha. After all, it's in her blood! Whether it be the music of Albéniz or de Falla or, as in this CD recording, some charming pieces by Granados, her performances always get to the core of the music. Her clean, quicksilver touch, the security and accuracy of her rhythmic expression, and the poetry and ardor with which she imbues lyrical sections make her readings unique.

The piano sound is very clean, and although it is recorded rather close, it is richly resonant in the warm acoustics of Walthamstow Town Hall. *Bert Whyte*

Bartók: The Miraculous Mandarin. The Detroit Symphony Orchestra, Antal Doráti.
London 411 894-2.

This recording of the complete "Miraculous Mandarin" ballet and the "Music for Strings, Percussion, and Celesta," by Béla Bartók, is among that rarefied group of Compact Discs which qualify as truly extraordinary.

This music was a specialty of Antal Doráti in his old Mercury Records days, and the evidence of this disc attests that the years have not diminished his skills. Further, the Decca engineers have done a truly stupendous job. Recorded in the flattering acoustics of the United Artists Auditorium in Detroit, the sound is ultra-sonorous, always clean, even in the most overwhelming of fortissimos. In cuts 5, 6, and 7 of "The Miraculous Mandarin," the massive perorations of the orchestra, with the relentless high-level pounding of the bass drum underpinned by the full-throated roar of great organ pedals, is simply awesome. Similarly, some of the percussion transients in the "Music for Strings" are of shattering impact.

For some, the dissonance of this music may be off-putting. For everyone else, this CD is an absolute must. *Bert Whyte*

House of Sleeping Beauties: Lucia Hwong
Private Music 1601.

The blending of Eastern and Western music is an attractive idea. But the results are often kitsch, as the most superficial aspects of the East are grafted onto the most simplistic structures of the West. Remember "raga rock"? What's needed is a complete rethinking of Eastern and Western traditions to form a new alloy. Lucia Hwong attains this ideal in *House of Sleeping Beauties*, a synthesis emerging out of Eastern and Western classicism, ancient instruments, and modern technology.

To realize her vision, Hwong has assembled the core of the Philip Glass Ensemble, including Kurt Munkacsi as producer, and a complement of Japanese musicians playing everything from shakuhachi to synthesizer. Together they sweep through a global-music landscape previously explored by Andreas Vollenweider.

Lush and panoramic best describe "Tibet Suite," a series of loosely connected, contrasting mood pieces. Energized minimalist cycles give way to Yukio Tsuji's mournful shakuhachi,


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There is sonic evidence in *House of Sleeping Beauties* that technology has been pushed to the limit. Even so, this is a compelling work by Lucia Hwong.

drawing "Reflections of Lunar Light." Woodwinds dominate the melodies. Tsuji's ocarina, which sounds a baleful clarion over the ritual electroacoustic percussion of "Journey to Lhasa," succumbs to the hellbent wail of Jack Kripl's soprano saxophone.

Except for occasional operatic vocals that sound like rejects from a Cecil B. DeMille biblical epic, *House of Sleeping Beauties* is a meticulous production. However, the digital recording reveals the problems of pushing technology to the limits, particularly on "Tibet Suite." Disconcerting ambient dropouts and occasionally crude editing between movements disturb the mood, especially at high volume. These flaws are masked on the cassette and LP; the CD is less forgiving.

But the CD also creates a wonderful depth of field on tracks like "Dragon Dance," where impassioned shakuhachi and kayagum solos are framed by ostinato synthesizer cycles buzzing through rolling drum sounds. Wisps of percussion, atmospheric synthesizer beds, and a cascade of Japanese stringed instruments, reeds, and violin merge in a combination that would be impossible without modern recording techniques. With *House of Sleeping Beauties*, Lucia Hwong has made a compelling entry into the global-music network. *John Diliberto*

Mozart: Symphony No. 40; Beethoven: Symphony No. 1. The Orchestra of the 18th Century, Frans Brüggen. **Philips 416 329-2.**

This Orchestra of the 18th Century is entirely made up of "authentic" period instruments, either products of the late 18th and early 19th centuries, or scrupulous copies thereof. With some 40-odd players—the largest such group I have heard to date—it edges forward into the standard symphonic repertory most people recognize, rather than focusing on esoteric earlier music.

The strings aren't too different; the winds, though, are radically unlike those of today in the playing. The early woodwinds—flute, oboe, early clarinet—had only a key or two and lots of plain finger-holes like those on a recorder. The brass—horns and trumpets—had no valves. Not too many decades ago it was thought impossible to play those old instruments, a lost technique. Now it has been found again, quite astonishingly.

So, what does all this mean on a new, all-digital CD? Reassuringly, the music sounds mostly as you'd expect it to sound, nothing radically different at all. These people are good. Not a glitch or a plop or an out-of-tune squawk is produced. They play just about as fluently as the best "modern" performers. (I use quotes because most of the current instruments reached their present form a century ago.)

Yet the CD's clarity of tone color, free from obscuring background audio, does reveal interesting differences. The old strings were less powerful; here you can notice it, in comparison with the rather loud wind sections, even though the usual numbers of firsts and seconds were used. Is this the way Mozart and Beethoven heard things? Very likely. We are used to too much string power.

The strings also have a more metallic, shiny sound than the "modern" violin, which helps make up for lack of volume; there is a certain sonic cutting edge. The wind instruments have a more colorful tone, rounder and fuller, notably the old oboes—very fruity. You will begin to hear interesting side effects as you listen further. The Beethoven symphony in particular is affected; oddly, it sounds more massive, more modern, more impressively big, than it does with conventional instruments. Just as Bach on the harpsichord sounds bigger and fuller than the same notes played on the piano.

Frans Brüggen, once a long-haired, Dutch kid-genius at playing the record-

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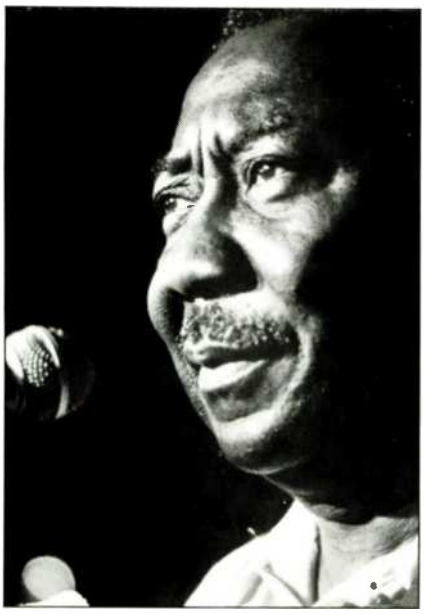
The notably clean sound of *Marni Nixon Sings Gershwin* seems almost clinical, but it's a good representation of what one would hear in a vocal recital.

er, is now a big organizer of this sort of enterprise, with a big reputation already. His tempi are, as I hear them, much too fast. The speed detracts from the subtleties of melody and harmony in the music itself, and worse, it fails to take the powerful hall reverberation into account. These are live performances, and the reverb is somewhat odd in the Dutch hall where they were recorded—full of what seems to be waves, or pulses. One should play more slowly, rather than blur up the sense at high speed. Only a mild reservation, however—I enjoyed the whole of both these "authentic" symphonies. *Edward Tatnall Canby*

Hard Again: Muddy Waters
Blue Sky ZK 34449.

Sound: B– Performance: B

Hard Again is a blues publicist's dream: Muddy Waters, the father of Chicago blues, reunited with James Cotton, a successful former sideman, under the direction of producer/guitarist Johnny Winter, who personally introduced the blues to many a rock 'n' roller. Released to critical accolades in the late '70s, the LP marked the beginning of the final phase in Muddy's long and remarkable musical career. If the record covered no new ground, it at least returned Muddy to territory he virtually defined.



As with Muddy's best work, the songs consist of ensemble performances instead of vehicles for extended soloing. The key to this set is Cotton, who's given freer reign than he ever had in his original role as a backup player. Cotton's amplified harp is always in the forefront, responding to Muddy's vocals in a traditional call-and-response pattern. Winter's normally mercurial guitar runs take a back seat to his quotations from the canon of classic Muddy licks. Winter's pleasure at aiding one of his mentors is summed up in his liner-note credit for the "miscellaneous screaming" (for joy) that punctuates this disc. Muddy himself is in fine voice, even if his singing had lost its threatening edge by the time of this recording.

If my memory and ears serve me well, Winter recorded much of this disc live in the studio to capture the feel of Muddy's Chess recordings from the '50s. He even followed the example of Chess Records founder Leonard Chess in mixing the bass drum way up front to give the band more kick. The resulting mix is so dense that too often the band doesn't hit a groove as much as pound it into the ground. The CD issue of this session is marginally cleaner than the record, but the sound, especially for a CD, is, well, muddy.

Hard Again and its follow-ups added little to Muddy's legend, but allowed him to end his career with the dignity and popular acclaim befitting his seminal role in American popular music. *Roy Greenberg*

Marni Nixon Sings Gershwin: Marni Nixon and Lincoln Mayorga
Reference Recordings RR19CD.

In this CD, Marni Nixon and pianist/arranger Lincoln Mayorga present a recital of Gershwin songs, performed from a classical musician's point of view. This doesn't prevent them from having fun with the music, nor does it keep jazz out of the interpretations. But they present this Gershwin collection as a cycle of American art songs, adding the jazz elements as color but always in a restrained way. Some people like this approach, while others prefer a more jazz-oriented style.

The effect is similar to that of an orchestra playing jazz—carefully calculated but lacking spontaneity and freedom. Nonetheless, some jazz compositions are just as nailed-down as these performances are. In this case, the improvisation process took place at the arrangement level, and was frozen at that point. Both Nixon and Mayorga inject their own personalities into these arrangements, and they do so with ultra-laid-back wit and polished style.

The humor in Mayorga's arrangements appeals to a person knowledgeable in classical music. In "By Strauss," he not only weaves in fragments of "The Blue Danube" and "Die Fledermaus" but also sneaks in a surprise fragment from "Der Rosenkavalier" by another Strauss. Near the beginning, he alludes to the "C'mon along" phrase in "Alexander's Ragtime Band." The effect is frequently Ivesian, especially when the quotes and transformations almost seem to be in another key. For "Embraceable You," Mayorga weaves a Bach "Two Part Invention" into the accompaniment, following an idea by Steven Blier. The entire album is full of these musical puns.

Nixon's voice has a clear, ringing tone—just the right sound for Bach and Stravinsky, but surprising for Gershwin. She controls her voice with the careful attention to detail of a classically trained performer. When, for example, she adds a jazzy glissando, she *controls* it. Compare her approach to

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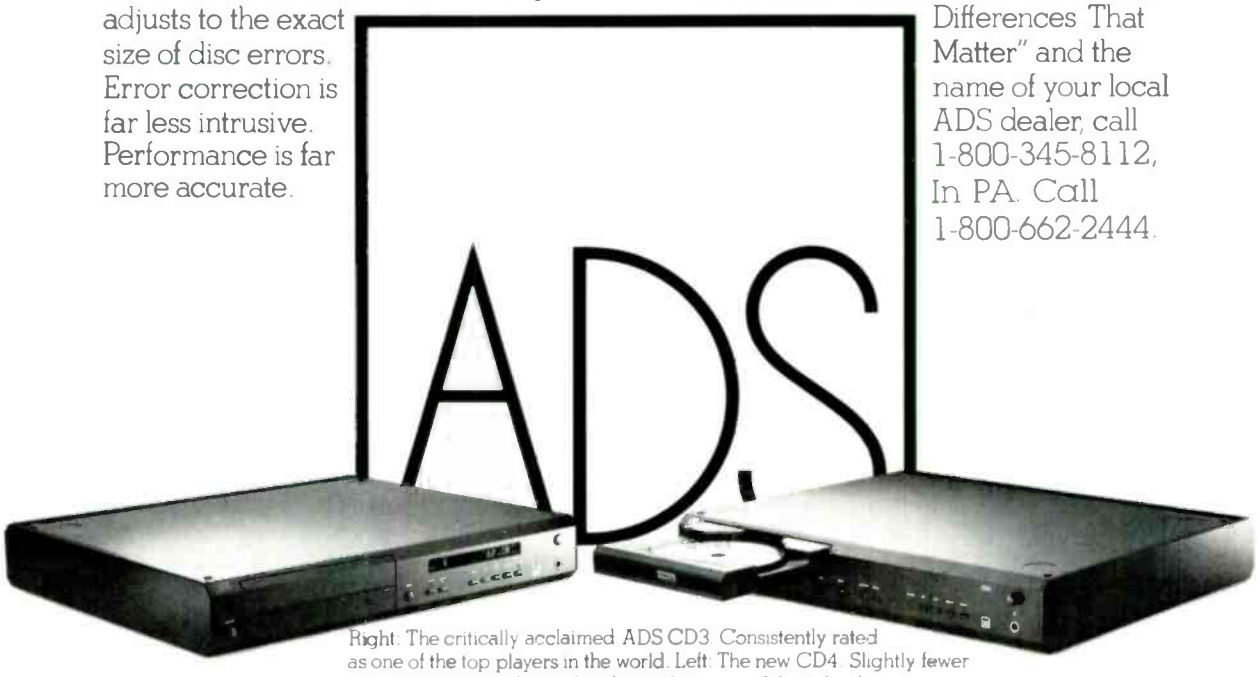


Right: The critically acclaimed ADS CD3. Consistently rated as one of the top players in the world. Left: The new CD4. Slightly fewer control functions, identical audio performance. Watch for the reviews.

Floridays is a pleasant, well-recorded collection of songs by Jimmy Buffett, but they're so mellow that one longs for a bit of tension and variety.

Sarah Vaughan's with Michael Tilson Thomas and the Los Angeles Philharmonic (CBS MK-37277), and to Ella Fitzgerald's with André Previn (Pablo Today 3112-50). In Vaughan and Fitzgerald you'll hear more emotion, more improvisation, and less of that classical control. What's so wonderful about Gershwin's music is that it sounds good either way. He, too, had a foot in both worlds, and his music helped to break down those distinctions.

J. Tamblyn Henderson's production style matches the performers' approach. The recording has the feeling of a rather reverberant recital hall. The sonic perspective is somewhat distant and the hall (the Oxnard, Cal. Civic Auditorium) seems sparsely filled. The ambience is strong in proportion to the direct sound, but the character of that ambience is excellent. Henderson's noticeably clean sound seems at times almost clinical, but it's an unusually good representation of the experience of a vocal recital. When Nixon hits the high notes, the sound remains clean and undistorted. The piano miking is a bit distant for my taste, but it's beautifully accurate.

Although this CD won't appeal to everyone, it has its charms. Once you understand where Nixon and Mayorga are coming from, it loses its austerity.

Steve Birchall

Islands: Scott Cossu
Windham Hill WD-1033/DIDX 210.

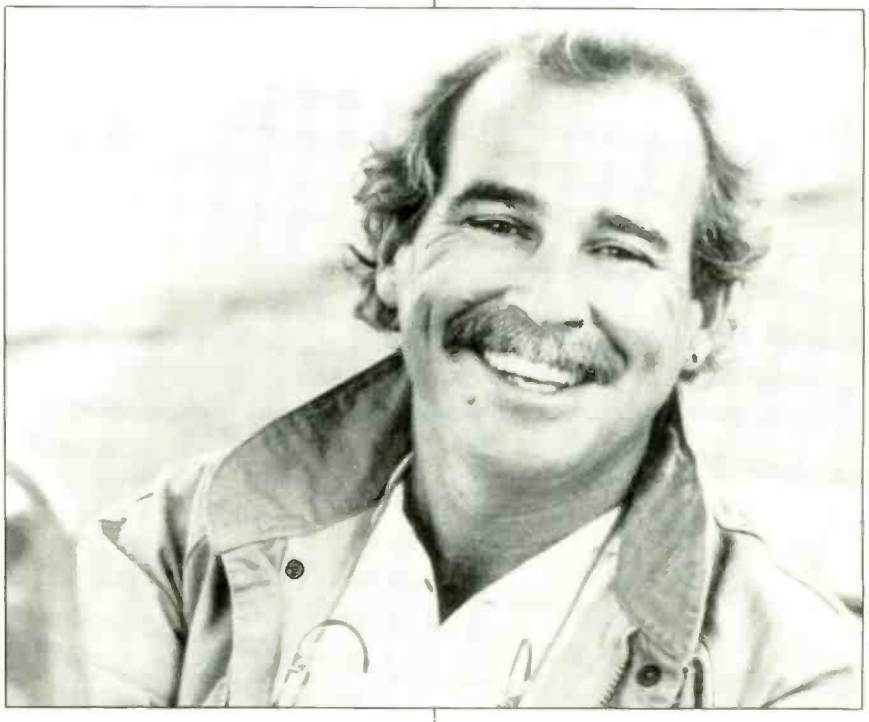
Sound: B+ Performance: B–

Scott Cossu is a gifted musician who plays piano in the recent tradition of George Winston and fusion in the mode of Pat Metheny. *Islands* finds him in the latter groove. There are no ringing guitars here, but there is Metheny's old rhythm section—drummer Danny Gottlieb and bassist Mark Egan—on "Ohana," "Harlequin Messenger," and "Oristano Sojourn."

These tracks bear the oft-imitated Metheny trademarks: Lots of changes, deft rhythms, and lyrical themes, all in a reverberating atmosphere. Egan's bass is frequently out front as a melodic instrument. "Ohana" could've stepped right out of Metheny's "Phase Dance," with its fanfare opening of ostinato piano and surging drums. Cossu's full-bodied chords and sweet improvisations are reminiscent of Lyle Mays, Metheny's keyboard-playing alter ego. Cossu can be rapturous or rambunctious behind the clean articulation of David Valentin's flute.

Cossu's most distinctive tracks dump the conventional fusion rhythm section in favor of Roger Squitero's congas, lending a sort of contemporary beatnik nostalgia to the proceedings. "Gypsy Dance" opens with some lush solo piano before breaking into a happy-go-lucky groove that could've wandered off a Vince Guaraldi soundtrack to a Charlie Brown TV special. Polish jazz violinist Michael Urbaniak takes an urgent solo, full of squeals and unexpected dips. It's nice to hear him in a non-funk context again.

Islands is a pleasant if not very challenging recording that makes the transition nicely to the CD format. There are times when the analog tape is evident, such as "Harlequin Messenger," which begins with an exceptionally noisy piano solo. It's as if all the faders were left open during the mix; the signal-to-noise ratio improves dramatically once the full ensemble makes its entry. But overall, this music lends itself nicely to the increased dynamic range the CD provides. *John Diliberto*



Floridays: Jimmy Buffett
MCA MCAD-5730.

Jimmy Buffett's easygoing, sunny-skies disposition is captivating, and his songs lope along in an amiable, tuneful kind of way that I find irresistible. His "Margaritaville" is a classic, one of the cheeriest songs about drowning one's sorrows ever penned. But I swear, if the man gets any more laid-back, he's gonna tip his chair over and whack his head on the parquet.

Floridays is a really pleasant collection of songs, but they're so consistently mellow that one longs for a bit of honest-to-god tension every now and then. Oh, Jimmy works himself up into an almost-rocking mode on occasion ("You'll Never Work in Dis Bidness Again," "Meet Me in Memphis"), but it's akin to the rocking of a hammock in a strong breeze; nothing ever cooks.

Taken individually, most of these cuts make for some satisfying listening. All have attractive melodies, neat Caribbean-flavored arrangements, and clever lyrics (how can you dislike a guy who's got "Creola in his soula"?). All that's lacking is a bit of variety.

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Clarence Clemons' voice is pulled back and muffled with instrumentation, as if someone didn't trust him to carry the album.

tered) is excellent. Triangles "ping" away, clean and gleaming, percussion is crisp, and Buffett's voice is often recorded front-and-center to reveal the man's warmth and intelligence. The separation is very good and instruments are, for the most part, nicely located in space. The only flaws in the recording are a bit of residual tape hiss, in spots, and an occasional lack of power in certain instruments, due to underamplification.

This is a likable disc that goes well with a cold, frosty margarita and mental images of sand and sun.

Paulette Weiss

City Slicker: James Young with Jan Hammer
Passport PB CD 6051.

Wanna hear a big, fat bass powerful enough to make your eardrums implode and meet just above your palate? How about a mess of guitar pyrotechnics that will sear those eardrums into smoking bits of charred protoplasm? *City Slicker* provides the means to both of these ends, yet the album isn't nearly as dangerous as it sounds.

Despite the fact that the illustrious Jan Hammer has contributed mightily to this James Young recording, *City Slicker* is pretty pedestrian heavy-metal rock. Young wields a mean axe, but his skinny, screaming guitar solos don't really go anywhere. His vocals are adequate but somehow amateur. Hammer's keyboard work and aforementioned bass are effective, but his presence adds no distinctive character to the music.

Transfer of the original analog recording to the Compact Disc format has had several noticeably beneficial results. The extended dynamic range truly serves the material here, which is most often feverishly loud but has its moments of delicacy. Some of the muddiness of the original has been cleaned up, but not sufficiently. Although some solo parts come through clean and clear (the acoustic piano in "Waiting," the sound of barking in "Wild Dogs"), layered or massed instruments turn muddy, and the sound occasionally goes flat as well. This goes beyond the standard heavy-metal muck; it's not just the product of fuzztone guitars, but of weak studio work.

Although I had great hopes for *City Slicker*, they were rudely shattered, along with my eardrums.

Paulette Weiss

Hero: Clarence Clemons
Columbia CK40010.

Clarence Clemons is the boss here, taking leave of buddy Bruce Springsteen to appear on his very own album. He brings his unmistakable sax to a nicely paced group of songs; cheery, uptempo tunes are balanced by tear-'em-up rockers, which are in turn cooled down by sweet love songs.

The backup star power recruited for this recording is dazzling. Sweet, sorrowful Jackson Browne and actress Daryl Hannah appear on "You're a Friend of Mine," Darlene Love lends her well-tempered pipes to an old beauty, "The Sun Ain't Gonna Shine Anymore," Booker T. Jones mans the organ here and there, and the multitalented Narada Michael Walden has produced, copenned several songs, and handled some percussion.

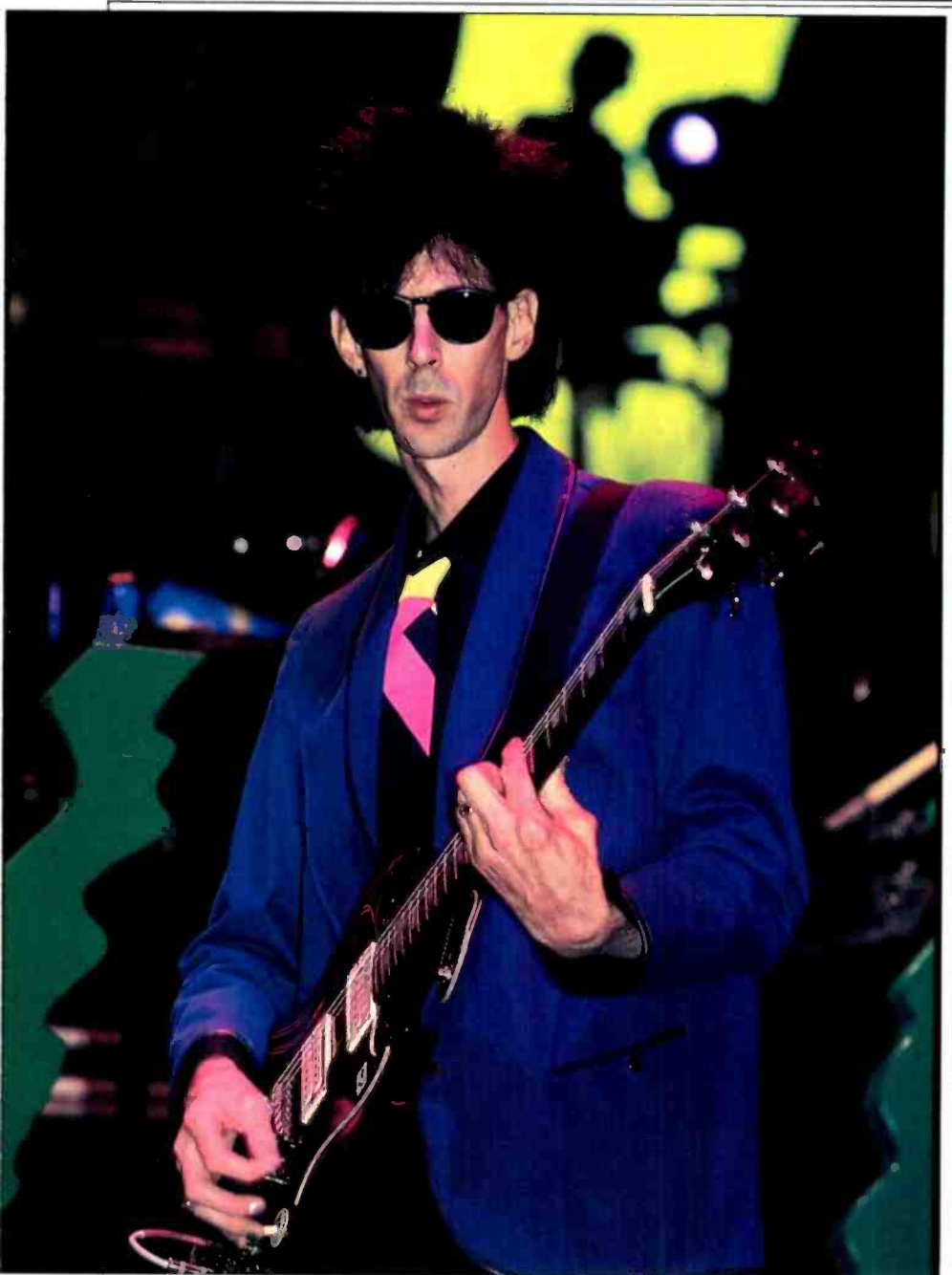
So with all of this talent gathered on one small Compact Disc, why is the result so naggingly unsatisfying? In part, it's due to the great expectations preceding its release. The other part has something to do with the reined-in feel this production has about it. When our hero Clarence is called upon to do a vocal, he's often pulled back into mid-ground and muffled with instrumentation. The instrumentals themselves frequently are slightly blurred, sometimes in an approximation of Phil Spector's wall of sound, but more often just to conceal something. It sounds like someone here doesn't trust Clarence's voice to carry the album, and this restraint is in evidence throughout. When Craig Thomas is substituted for lead vocals, his rich, sweet voice is brought up front, and the arrangements open up and clarify.

The recording is actually quite good, if one assumes the muffled quality was a deliberate production choice. The great, thumping jungle drums on "I Wanna Be Your Hero" will set your liver a-quiver, yet the tiny, buzzing synthesizer effect laid down on top of the drumwork comes across clear and defined. Percussion is often crisp and solid, yet almost as often it's muted and ephemeral. Separation is excellent, and the extended dynamic range is impressive. To buy or not to buy is something you'll have to decide on your own.

Paulette Weiss

MICHAEL TEARSON
JON & SALLY TIVEN

SOLO VEHICLE



Photograph. ©1984, Ebet Roberts

This Side of Paradise: Ric Ocasek **Geffen GHS 24098,** $8.98.

Sound: B Performance: B+

Ric Ocasek's latest solo effort (the previous was released in 1982) seems to allow him to use a broader musical palette than possible on albums by The Cars. Perhaps with a solo effort it is easier to do away with obvious commercial trappings and simply say what it is you want to say. This is not to imply that *This Side of Paradise* is not marketable—it is, indeed—but rather that it has a nice touch of emotional depth and introspection that is sometimes missing on Cars releases.

Ocasek is one of the quirkiest songwriters and singers in today's music, and one of the most astute observers of the human emotional condition. On this album, Ocasek continues to write about problem-filled relationships, confused lovers, and unflagging love, but he does so in different moods. He takes the listener on an extremely well-crafted musical adventure, from the more commercial songs, such as "Emotion in Motion" (which sounds like Richie Valens, David Gates, and The Association going high-tech), to the more reflective pieces, such as the title cut.

One thing that remains constant in any Ric Ocasek work is his feel for musical technology. Here he uses sequencers and computers and the Synclavier computer keyboard to create background textures and fills that are highly imaginative and technologically advanced. There are surprises everywhere, even in the passages used to link some of the songs.

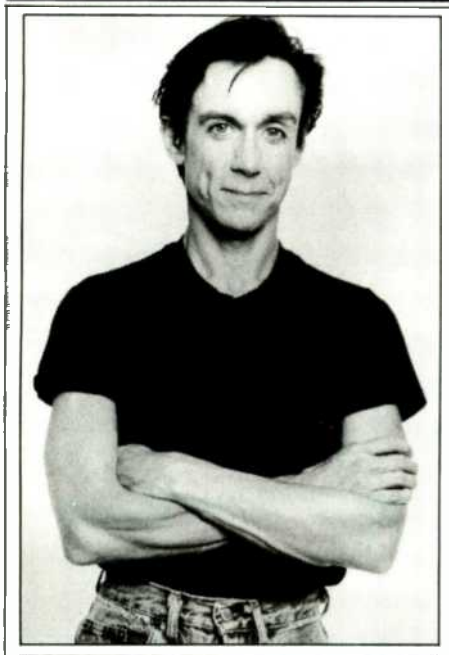
Ocasek originally began *This Side of Paradise* with producer Jimmy Iovine but then went back to the drawing board and completed production with engineer Ross Cullum and coproducer Chris Hughes. Playing with Ocasek were Cars keyboardist (and bassist here) Greg Hawkes, and guitarists G. E. Smith, Steve Stevens, Roland Orzabel, Tom Verlaine, and Elliot Easton, another Cars cohort. Drums were played by producer Hughes. The Synclavier and other musical computers, which contribute enormously to this album, were programmed by Andy Topeka.

Sonically, this album is nearly flawless. It was recorded and mixed at Electric Lady Studios in New York City, with additional recording at The Wool Hall Studios and The Town House Studios in England. Engineer Cullum and mix engineer Joe Barbaria have done a laudable job of capturing the music, which, because of the heavy use of sequencers and computers, potentially could have been a recording nightmare. Also, the album pressing is very quiet (and the Compact Disc should be extraordinary).

Cars fans will take to this album immediately, but while they are listening they will get a chance to hear the group's principal writer in a new way. Ocasek has created a happy marriage between pop music and high technology, and he shares it with us on *This Side of Paradise*. *Hector G. La Torre*

See page 137 for more information.

This is the best-sounding album Iggy Pop has made, but he hasn't sold out: His vocals are aggressive and the music has kept its edge.



Blah-Blah-Blah: Iggy Pop
A&M SP-5145, $8.98.

Sound: B Performance: A

The best dancer in rock 'n' roll has returned with a record that for once captures his vocal style intact. Iggy Pop is not the prototypical rock singer, but his snarl and delivery are original and potent, as is his songwriting talent.

Lately our boy Pop has been mighty quiet, only contributing the occasional cowrite to a Bowie record ("China Girl") and releasing a rather half-baked LP on Blondie's now-defunct Animal Records. Despair not, for his patron David Bowie has spent some time producing a new Iggy album in Switzerland, and it's a treat for the ears. With a few songwriting contributions from ex-Pistol Steve Jones, and a few from Bowie himself, Iggy has fashioned his best-sounding and most commercial record ever, without diluting his presence one iota. Most of the music has been supplied by guitarist Kevin Armstrong and a multi-instrumentalist named Erdal Kizilcay. (Who is this guy?)

Some of you may scream "Sellout!" but in fact this is hardly the case. Iggy's lyrics and vocals are as aggressive as ever, and the music is more musical (dig those real strings!) without losing its edge. Do not begrudge Iggy Pop his royalty check; he has earned it. *Jon & Sally Tiven*

Legend: Buddy Holly
MCA MCA2-4184, two-record set, $8.98.

Sound: B+ Presentation: A

This 20-song "best of" collection first appeared as a CD, and now it has been released as a double-pocket LP set and a single cassette. What is special about it is that compiler Steve Hoffman went back to the original, first-generation stereo and mono master tapes and digitally remastered the material. As a result, these great performances have never sounded better or clearer or more immediate. It is as if gauze has been stripped away—especially on the cassette version, which has the added advantage of only needing one flip.

(A word of caution: There is a very similar collection that's been out for a few years, also on MCA, called *20 Golden Greats*. It's a single album, and its sound does not measure up to that of *Legend*.)

In his brief notes, Hoffman remarks, "Elvis might have been bigger, but Holly (in hindsight) had a far greater influence on modern music." Well put. Imagine what might have been had Holly not died at age 22 in that plane crash. Who can guess what kinds of songs he would have written?

Legend is *the* essential Buddy Holly collection, in whatever format you choose. *Michael Tearson*

Break Every Rule: Tina Turner
Capitol PJ-12530, $9.98.

Sound: B Performance: B

R&B? Stands for rockin' and blues, in the dictionary according to Tina.

Turner's second solo album is a much-anticipated follow-up to a smashing solo debut, one that shone with delightful budget-basement freshness. The extra time and money spent on the sequel is obvious—*Break Every Rule* has an air of expensive calm.

While her new album may lack the breathless excitement of *Private Dancer*, Turner herself doesn't. She still snaps and snarls without getting cutesy about it, and though young white males wrote all 11 songs here, her easy, natural phrasing and teasing voice decidedly rewrote them.

Yet, except in the chugging single, "Typical Male," and the rollicking, thrumming "What You Get Is What You See," the songs' melodies are a bit insubstantial; the album is mostly mid-tempo, soul-inflected rock, pleasant for the most part but nothing that will slice you to the bone. Terry Britten's production (on side one) evidently contributes to this flatness; the flip side, the product of three other sets of producers, is much punchier, with sassy guitar and sax lines in the forefront. (The credits say that Britten's side was Ambisonic surround-sound encoded; whether that was a factor in the so-so mix is hard to say.) Neither side, however, is a font of future standards.

Most of the time, *Break Every Rule* manages to avoid falling into a typical thematic trap, that of a star performer making an album about being a star performer. We're not *always* so lucky; "Afterglow" is one more the-stage-is-cleared-and-loaded-and-the-highway-calls-again song, and "Overnight Sensation" is a disappointing I-had-to-beat-the-stagefright-I-had-to-cry-all-night story. These are actual lyrics, folks. But what with six sets of writers and four sets of producers involved in the project, I'm surprised that any unity is maintained at all.

When the lyrics work, Turner and team make biographical elements universal. "Till the Right Man Comes Along," "Break Every Rule," and the

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Hannibal has done a loving job of repackaging the records of Nick Drake, the man-child whose sadness created beauty in song.

half-anguished, half-defiant "Typical Male," in particular, speak to any of us who've been suckered by a pretty face, who've told white lies to manipulate a loved one. Turner plays on both sides of the fence, chastising her lover in "Back Where You Started" for using the very tactics she espoused in "Break Every Rule." But then again, has anybody ever been in a love affair without contradictions? *Break Every Rule*'s triumph is that Tina convinces us that all these feelings and doubts aren't just ours, but hers. *Frank Lovece*

Fruit Tree: Nick Drake
Hannibal HNBX 5302, four-record set, $28.95. (Available from Carthage Records, P.O. Box 667, Rocky Hill, N.J. 08553.)

Sound: B Performance: A

A few years ago, Island Records released a boxed set of Nick Drake's complete works, under the name *Fruit Tree*. It comprised all three of his albums, plus four songs that had been unreleased. Hannibal's new edition has all of these plus 10 more previously unreleased recordings.

Nick Drake was a very shy, withdrawn man-child who flowered in song. He sang in a near whisper, and there was always something ethereal about his music, a dreamy elegance that was beautiful to hear. It made him special among the singer/songwriters of the late '60s and early '70s.

His first album, *Five Leaves Left*, dates from 1970. It was lovely if somewhat tentative. Participants included Richard Thompson and Pentangle bassist Danny Thompson, among others, but the most important ingredient was the classically inspired arrangements of Drake's school chum Richard Kirby. The following year brought Drake's finest work, *Bryter Layter*, on which Thompson and Thompson again took part, further abetted by the then-new Fairport Convention rhythm section of Dave Pegg and Dave Mattacks, plus John Cale. It was Drake's most hopeful-sounding work. *Pink Moon* appeared a year later, a stark, solo-voice-and-guitar album in which a dark fear had crept into Nick's work.

And then he died, much too young.

Drake's strange, strong sadness created beauty in song, and Hannibal has collected all of it here. The label has done a loving job of packaging the set. The sound is very fine, even on the primitive home recordings. The accompanying booklet includes a fine biographical and explanatory essay, plenty of pictures, and lyrics to all of the songs. Three of the record sleeves reproduce the original album covers, and the fourth has excellent notes providing details about the previously unheard material that is included in this package.

I give Hannibal's release of *Fruit Tree* my highest commendation.

Michael Tearson

Private Revolution: World Party
Chrysalis CHR 41552, $8.98.

Sound: B Performance: B+

Who would have guessed that a splinter from The Waterboys would have so much appeal? *Private Revolution* is essentially a one-man effort by former Waterboy Karl Wallinger, who sings like a cross between Bob Dylan and early-'70s Jagger and likes to write in a variety of genres. The album isn't wholly consistent, and the first single (the title cut) is highly untypical of the rest of the record—the rest being far superior. "Ballad of the Little Man" recalls "Subterranean Homesick Blues," and there is also a cover of "All I Really Want to Do," in case you didn't pick up on the Dylan connection. In the song "World Party," Wallinger takes all of his musical influences and wraps them up in a neat statement. This is a very interesting and entertaining debut.

Jon & Sally Tiven

Bouncing Off the Satellites: The B-52's
Warner Bros. 25504-1, $8.98.

Sound: B– Performance: C–

With an album released 14 months after it was recorded, perhaps delayed by the untimely death of group guitarist Ricky Wilson, those wacky B-52's are back from a very long absence. But they are surprisingly sober-faced here; their usual humor is subdued a bit, as is their music. The pulse that marked their early records is still evident, but the purpose it serves has changed. No longer an ominous portent, the throb is now generated by drum machines, and the mechanical beat leads to a mellower feeling. Even the songwriting feels calmer, less earthshaking than in the halcyon B-52 days that brought us "Rock Lobster," "Planet Claire," and "Private Idaho."

While the album is remarkably consistent in mood, it just rolls along and never really works up much of a sweat. Thus, by the end it is not very fulfilling. The B-52's are floundering, and after listening to *Bouncing Off the Satellites* I felt a real need for a hearty dinner.

Michael Tearson

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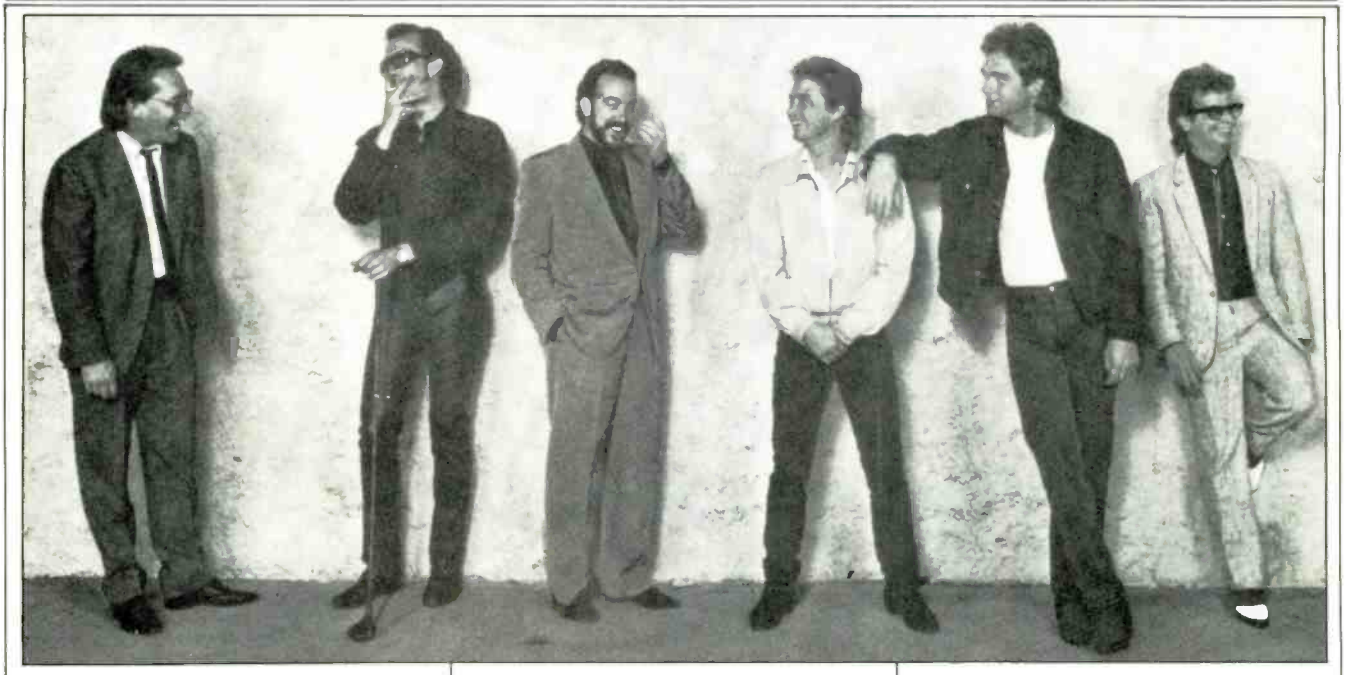
Huey Lewis & The News is America's number-one bar band and not much more; when they try to be flashy, they trip up.



Crash: The Human League
A&M CS-5129, chrome cassette, $8.98.

Sound: B Performance: D

The Human League, those dance-floor mavens, have hitched up with the hot production team of Jimmy Jam and Terry Lewis for *Crash*. The resulting album sounds wonderful. It is bright and sparkly, with excellent presence that jumps out bodily at you. The only flaw is that the songs are dumb. Only "Love on the Run" seems like anything special. *Crash* is great-sounding bubble gum. *Michael Tearson*

Fore!: Huey Lewis & The News
Chrysalis OV 41534, $8.98.

Sound: B Performance: B–

"Power of Love," the single used in the movie *Back to the Future*, was a big step forward for this band; one got the impression that they were moving away from mass-market fodder and closer to something rootsy. Their latest album, however, is a lot closer to a retread of their last multi-platinum long-player, with a few tributes to '50s rock thrown in ("Stuck with You" and the Presleyisms of "Whole Lotta Lovin' "). Lewis sings well, and although his lyrics are a bit embarrassing, he's a likable git.

The News is America's number-one bar band and not much more; when they try to play flashy solos or write songs that stray from predictable progressions, they trip over themselves. Personally, we'd love to hear these guys drift a little closer to the white R&B/blues that they're quite capable of delivering, but they're happy to be pop mavens—and who can blame them? *Jon & Sally Tiven*

Landing on Water: Neil Young
Geffen GHS 24109, $8.98.

Sound: B+ Performance: A

There are two things no one will ever accuse Neil Young of. One is consistency. Quite the reverse: Just since joining Geffen Records, he has gone from computer rock to rockabilly to Nashville country, and now there is the stripped-down, modern, electronically tinged, hard-rocking *Landing on Water*. Second, no one is likely to say Neil's vision is pretty. Most often he is sour and curmudgeonly and sarcastic. But he is never at a loss for something to say. These twin strains combine on *Landing on Water* to produce one of Neil Young's best albums.

There are only three players: Young (lead guitar, synth, vocals), Danny Kortchmar (guitar, synth, vocals), and Steve Jordan (drums, synth, vocals). On two songs the San Francisco Boys Choir is added for an ironic twist. The music comes in sharply defined, pulsing meters made more prominent by the drums that dominate the mix. Perversely, Young's searing guitar leads, some of the best he has recorded, are mixed way, way down. The result is tart and bracing.

Then there is the matter of Young's songs, which comprise one of the darkest sets he has ever written. It starts off somewhat rosy in "Weight of the World," as a fellow full of self-pity falls in love. Next, "Violent Side" begins calmly enough. However, the song builds tension relentlessly so that by the time the boys choir joins in, you feel like putting a fist through a pane of glass for fun. In "Hippie Dream," Young warns that the wooden ships his erstwhile comrades Crosby, Stills and Nash sang about were no more than "a hippie dream/capsized in excess/if you know what I mean." "Touch the Night" contrasts two scenarios: One an ugly crash from which a man walks away without a scratch, the other a woman leaving a man (the same one?).

On side two, "People on the Street," "Hard Luck Stories" and "I Got a Problem" all delve into alienation. The album ends with the solipsism of "Drifter," in which a man says he will stay "until you try to tie me down."

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Elvis Costello's music stretches and retracts, meandering from jungle drums to electric twangs to found sounds.

Neil's writing is powerful, with tight focus giving this album a continuity that makes the whole more than the individual parts. Get close to the lyric content, and *Landing on Water* becomes very unsettling. Combine that with gutty, hard-hitting music and it adds up to a Neil Young album of unexpected power on several fronts. *Landing on Water* is a very fine yet very scary performance. *Michael Tearson*

Blood and Chocolate: Elvis Costello and The Attractions
Columbia C 40518.

Sound: C– Performance: B

Now that Declan MacManus has had his joke on America and retained his *nom de guerre*, Elvis Costello, he throws us another curve by calling himself Napoleon Dynamite on his new album. Only on the lyric sheet and under his photo, however; he's still MacManus where the copyrights roam, and Costello in the record racks.

No wonder the cast of characters in these 11 songs are alternately confused and bemused, as Costello limns elusive imagery with conclusive images. It may be hard to tell exactly what he's getting at in "Battered Old Bird," with its rooming house full of confused, possibly psychotic characters, but it's disturbingly easy to picture the milquetoast nutcase who "swallowed sleeping pills like dreams/with a bottle of sweet sherry that everything redeems."

The songs' melodies, like their lyrics, stretch and retract; they meander from jungle-drum openings through electric twangs to found sounds—some mellifluous, some jarring. There are no three-minute pop songs. Nothing here, in fact, is liable to be heard over any radio station not programmed by James Joyce. At times, as in "Tokyo Storm Warning," the free-associative silly seriousness seems like Dylan-meets-Zappa. Other times, as in a soliloquy with bare musical accompani-

Nine Lives contains some of Bonnie Raitt's best recorded singing, but the material she's chosen is not worthy of her.

ment ("I Want You"), Costello recites more than sings, his frustration—about what?—rising and falling. At yet other times, as when Costello's nasal vocals are joined by wife Cait O'Riordan's dulcet sweetness, the chocolate covers up the taste of blood. Maybe that's what Costello's whole lecture-cum-poetry-session is all about. *Frank Lovece*

Nine Lives: Bonnie Raitt
Warner Bros. 25486-1, $8.98.

Sound: B– Performance: B–

Bonnie Raitt's singing is terrific on *Nine Lives*, her first release in four years. Her voice has always been distinctive, and she's got a really natural style. Somehow, though, she has had no end of trouble putting it all together on records. This time, while *Nine Lives* does have some of Raitt's best recorded singing, the material is simply not worthy of her.

The album is an amalgam. Side one was recorded recently in Los Angeles,

and produced by former Little Feat keyboardist Bill Payne and engineer George Massenberg. Side two opens with "Stand Up to the Night" from the 1986 film *Extremities*, and continues with four selections recorded in 1983 for an album that was never released.

Most of the best material is on side two. Bonnie just wails on "Stand Up," elevating the song to something special. Jerry Williams' "Excited" also benefits greatly from Bonnie's commitment. The side's last two cuts are the cream of the crop. Toots Hibbert's "True Love Is Hard to Find" is a song Bonnie has been singing in concert for years, and here she has brought in blues singer Sippie Wallace for a cameo. The finale, Eric Kaz's "Angel," gets as much of its emotion from Bonnie's slide guitar (a sound rarely heard these days) as it does from her strong singing. There is a spareness to the '83 sessions that allows Bonnie's strengths to come through. The film song, in contrast, features a nervous, full, throbbing

Rock Therapy proves that The Stray Cats can still play '50s rockabilly with authority. It's nice to hear them together again.

arrangement, but it too gets an inspired reading.

Side one has problems. The distinctiveness of Raitt's voice is still brought to bear, but the sound of the sessions is assembly-line L.A. pop. Best of the batch are Bryan Adams' "No Way to Treat a Lady," and "Who But a Fool (Thief into Paradise)," with its steamy New Orleans funk groove.

There is no question that Bonnie Raitt is as compelling a singer as ever. One day she *will* make a great record, but *Nine Lives*, alas, just isn't it.

Michael Tearson

No Guru, No Method, No Teacher: Van Morrison
Mercury 830 077-1, $8.98.

Sound: B– Performance: B

Personal nearly to the point of idiosyncrasy, *No Guru, No Method, No Teacher* is nonetheless more accessible and less introverted than Van's last few releases. It is not flashy; rather, it's hypnotic—cool but intense. Only the single "Ivory Tower," the last cut, is something one could call upbeat.

The album proceeds at a leisurely pace, and some of it harks back a long ways, such as "Tir Na Nog," with a shimmering string arrangement by long-time Morrison pianist and friend Jeff Labes. The band's playing is just lovely, and the recording, produced by Van with Jim Stern and Mick Glossop engineering, is very pleasing. Clarity is critically important to music as subtle and meditative as this is, and it has been achieved here—without much flash or punch, but with a pleasing gentleness.

Van Morrison's songs are ripe with the scenery of his very private and bucolic world. It truly is a lovely place to visit. *Michael Tearson*

Rock Therapy: The Stray Cats
EMI America ST-17226, $8.98.

Sound: C Performance: B–

Yes, The Stray Cats did split up a couple of years ago. However, early in '86 Brian Setzer, Slim Jim Phantom, and Lee Rocker had a rapprochement that led to their camping out in a studio for a week. *Rock Therapy* is the aptly named result, a genuine quick-flash album that is evenly split between oldies like Gene Vincent's "Race with the Devil," Chuck Berry's "Beautiful Delilah," and Buddy Holly's "Looking for Someone to Love," and new originals by Setzer and the other Cats. I'm fonder of the oldies, but "I'm a Rocker" and "Reckless" are pretty nice, and they don't sound out of place next to the classics. Others, like the well-intentioned near miss, "Broken Man," don't feel quite so comfortable.

When The Stray Cats broke onto the scene, they singlehandedly created a big revival of '50s rockabilly, and they still play that music with authority. After all the bitterness that led to their split, it is satisfying to hear them playing together again, even if it is a one-off. *Rock Therapy* is a fun album with good spirit and decent if not outstanding sound. Even though there isn't another "Runaway Boys" here, there's still considerable charm. *Michael Tearson*

Live: George Thorogood & The Destroyers
EMI America ST-17214, $8.98.

Sound: B Performance: A

There is no better way to experience that ultimate good-times bar band, George Thorogood & The Destroyers, than in live performance, and that is just what you will be able to do with their latest album, recorded on a hot night in Cincinnati.

Lots of George's favorites are included, among them "Who Do You Love?" "Night Time," "I Drink Alone," "Bad to the Bone," "Madison Blues," and the inevitable "One Bourbon, One Scotch, One Beer." There's also a slow blues change of pace in "The Sky Is Crying," a nifty novelty in "Alley Oop," and a rousing closer in Chuck Berry's risqué "Reelin' and Rockin'."

Terry Manning, coproducing with George and the boys, has done a terrific job of capturing that special chemistry and excitement of live performance. The recorded sound really jumps out at you.

No doubt about it. This live one from George Thorogood is a fabulous party-time disturb-the-neighbors kind of album. Play it loud! *Michael Tearson*

CAR AUDIO TODAY

BULLETIN NO. 1

HOW ALPINE RE-ENGINEERED THE CD PLAYER AND TUNER SECTION TO SHARE THE SAME IN-DASH CHASSIS.

It began with the goal of a car audio system able to do justice to the most artfully recorded music. It led to the development of a Compact Disc player smaller and more advanced than any before. And an FM-AM tuner of astounding capability. It resulted in Alpine's new Model 7902. The first true single-chassis all-in-one design available in a standard DIN-size unit.

Throughout the 7902, Alpine has blended the digital engineering of CD with state-of-the-art analog circuitry to precisely control the musical signal at all stages of its journey. A double-oversampling linear-phase digital filter eliminates the distortion you hear when digital signals are converted into analog form. The filter suppresses ultra-high frequency signals before their conversion to analog, while the double over-sampling process improves the upper-band frequency response. The result? Dramatically reduced harmonic distortion in your music.

Once the music is converted to analog form, the signal continues to pass through a Butterworth analog filter. This rejects the ultra-sonic noise that is characteristic of CDs.

ABSORBING THE SHOCKS OF THE ROAD WITHOUT LEAVING THE TRACK.

The mechanics of the 7902's CD section are no less innovative than its electronics. Alpine has combined its own 3-beam laser pick-up with a series of other advances. Together they deliver exceptional sonic accuracy, while compensating on the road for the bumps and jars that can cause a lesser CD player to mistrack.

A specially designed gear system for the laser drive prevents backlash — the looseness that degrades tracking accuracy. The 7902 uses unusual two-layered gears, with a spring placed between them to maintain tension. So the drive operates with absolute precision.

Silicon oil dampers also protect the CD mechanism from vibrations and outside shocks. And the entire CD assembly is mounted on a rugged zinc die-cast chassis that's able to absorb shock and vibration better than a common pressed steel or aluminum die-cast chassis.

Alpine's 3-beam laser pick-up uses a diffraction grating to split the laser light into a main beam and two "sub-beams." Constant comparison of the two sub-beams instantly corrects the main beam's alignment, keeping it right on track. Remarkably, Alpine engineering has packaged all these advances into the first CD pick-up small enough to share an in-dash DIN-sized head unit with an equally advanced FM-AM tuner.

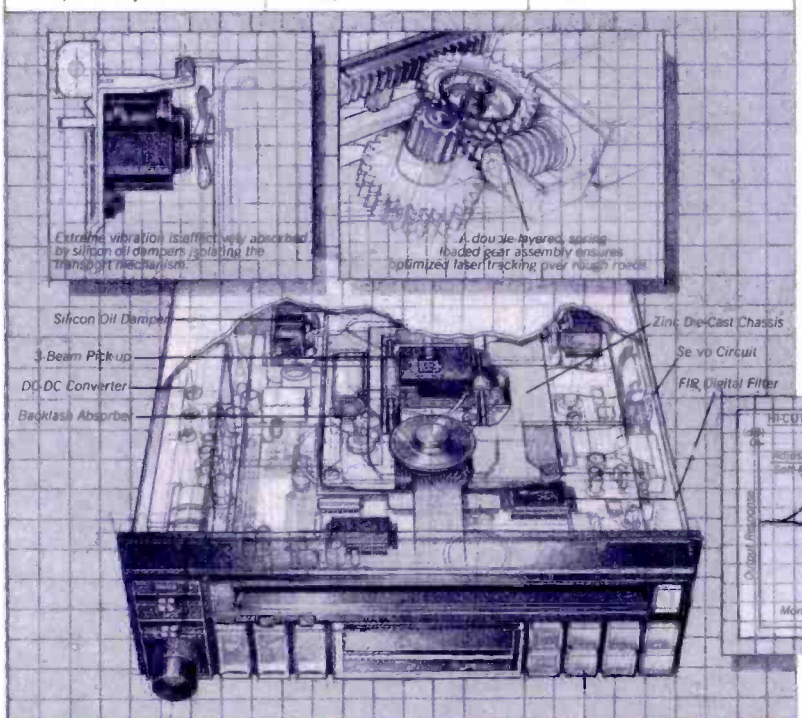
GIVING THE MOST DISTANT STATIONS A POWERFUL RECEPTION.

The Model 7902 incorporates a tuner section that's already legendary for its performance: Alpine's remarkable T-10II Tuner.™

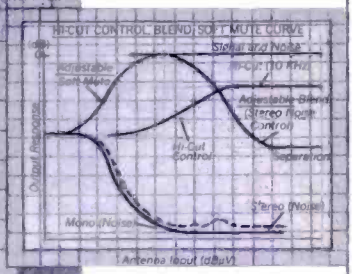
Its circuitry was created using STAR (Signal Transit for Accurate Response) topology. This technique keeps critical circuits separated to avoid interference, while using computer-aided design to engineer the shortest routes for signals to travel. By streamlining the tuner's electronic pathways STAR achieves exceptionally clear reproduction with greater dynamic range and a truly linear musical output.

Three other Alpine innovations contribute to the T-10II Tuner's ability to make the most of your favorite radio stations. A double balanced mixer removes signal saturation from strong FM broadcasts before it reaches the tuning stage, so headroom is increased. Selected dual-gate MOSFETS reduce the noise level in the receiver. And a double automatic gain control circuit reduces the intermodulation distortion that can degrade your musical reception.

Making the 7902 all the more unique is a shielded, pulse-width-modulated power supply designed with dual circuitry — two discrete power blocks that eliminate high-frequency signal interference. This rethinking and redesign of every aspect of circuitry results in improved clarity and definition, and contributes to the exceptional musicality of the 7902.



A CLOSER LOOK AT THE ALPINE 7902 CD PLAYER/FM-AM TUNER.



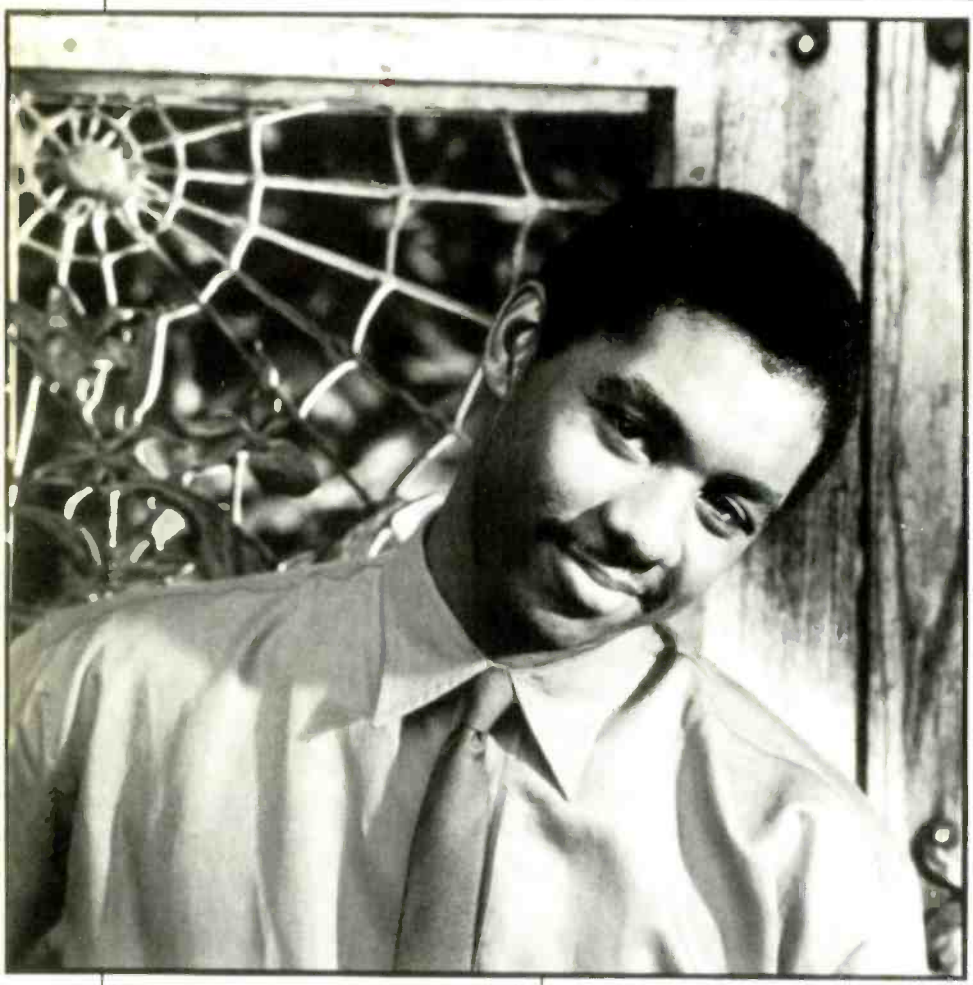
High cut, blend and soft-mute circuits work together to maximize reception of weak FM stations, and minimize static noise.

It all adds up to a tuner with superb clarity and definition. In an incredibly small package that, combined with Alpine's equally compact new CD section, makes the model 7902 a first for Alpine. And a first for the mobile audio industry.

To see and hear Alpine's new 7902 CD Player/FM-AM Tuner, visit your local Alpine autosound specialist.

ALPINE

BROTHERGOOD



Royal Garden Blues:
Branford Marsalis
Columbia FC 40363.

Sound: B– Performance: B

Branford, the "other" Marsalis, is the sax-playing brother of trumpeter Wynton and son of pianist Ellis. Unlike his elder brother, who espouses a purist jazz and classical aesthetic, Branford likes to mix it up. At 26, he's not afraid to jeopardize his hard-earned jazz credentials by working with Sting on *The Dream of the Blue Turtles* and in the *Bring on the Night* concert film and tour. But left to his own devices, Branford shows in his jazz recordings that he can swing with a vengeance, too.

The title track is an old New Orleans song by Clarence and Spencer Williams, from the earliest days of jazz. Branford is respectful without being pedantic, giving the opening bars a brisk reading before sliding into a scurrying soprano saxophone solo. Drummer Al Foster and bassist Ron Carter shift from an early jazz two-step into a decidedly post-modern double-time groove. It says a lot for Branford that he can make this music his own.

More in his own time frame are the barnstormers "Emanon" and "The Wraith of Tain," written by Wynton and Branford, respectively. "Tain" is the more turbulent, with drummer Jeff "Tain" Watts thundering through, recalling the mad drive of Elvin Jones. Here Marsalis pays passing tribute to John Coltrane, scorching his tenor with controlled but edgy scalar leaps, twisting his soprano in lyrical spirals. Kenny Kirkland ably frames it all on piano, while bassist Charnett Moffett navigates with resonant thrusts.

Royal Garden Blues is intimate, yet it doesn't feel closed-in. The recording appears to have relied on natural room ambience, with little post-production reverb added. This approach is especially helpful on the ballads "Dienda" and "Shadows," which show Marsalis' sense of control and nuance as he milks the melodies for every last breathy drop, evoking the passion of Sonny Rollins and the world-weariness of Dexter Gordon.

Whether working with veterans like Herbie Hancock and Ron Carter, peers like Kirkland, Moffett and Watts, or even his own father (on the straight-ahead "Swingin' at the Haven"), Branford Marsalis proves himself a distinctive voice in jazz. *Royal Garden Blues* isn't innovative and isn't likely to be influential, but those traits may not be far behind, especially if this Marsalis continues in the tradition of other ex-Art Blakey sidemen. *John Diliberto*

Tenku: Kitaro
Geffen GHS 24112.

Sound: B+ Performance: B–

Discovering Kitaro's music about six years ago was, for me, like unearthing a rare and precious artifact. Available only as Japanese imports, with virtually no English on their covers, his albums held the mystery of a hieroglyph. The music emerged with lush sensuality. Delicate Asian melodies were woven into natural and synthesized soundscapes, rhythms tugged at your sleeves, and swelling electronic strings crescendoed with rapture.

The *Silk Road* trilogy, *Ten Kai*, and *Full Moon Story* breathed the air of the

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ARIZONA: **Flagstaff** Sound Pro **Glendale** Twentyfirst Century **Lake Havasu City** Sound Bank **Lakeside** Specialty Electronics **Mesa** Twentyfirst Century **Phoenix** Jerry's Audio For Your Car, Twentyfirst Century **Prescott** Smith Electronics **Tempe** Twenty first Century **Tucson** Audio Emporium, Classic Car Sounds, Classic Car Stereo **Yuma** Warehouse Stereo

CALIFORNIA: **Alhambra** Audio Specialist **Anaheim** Anaheim Hills Car Stereo, Henry's Audio Stereo **Antioch** Pantell's Antioch Music **Auburn** Auburn Car Tunes **Azusa** Al & Ed Autosound Center **Bakersfield** Trans Lex Travelin' **Bellflower** Long Beach Auto Radio **Berkeley** Franks of Berkeley **Brea** California Mobile System **Canoga Park** Car Fidelity **Carrillos** Your Sound **Chico** How's That Sound **Chula Vista** Mad Jacks **Clovis** The Sound Shop **Compton** Al & Ed Auto sound Center **Concord** Autohaus Automotive **Costa Mesa** Car Fidelity, Long Beach Auto Radio **Covina** Whistle Stop **Daly City** Matthew's TV & Stereo **Del Mar** Rancho Auto Sonics **Dublin** Mobile Acoustics **El Centro** Kukuk's Warehouse Stereo **El Toro** Henry's **Encinitas** North County Stereo Encino Car Fidelity, Sound Factor **Escondido** Auto Security Sound, Mad Jacks, Eureka Eureka Car Stereo **Fairfield** C&M Stereo Unlimited **Fremont** Mobile Acoustics **Fresno** Banana's Hi Fi **Gardena** Allen's Electronics In Motion **Gilroy** Hogue Bros. Auto Stereo **Glendale** Valley Landau **Goleta** Creative Stereo **Hacienda Heights** Audio Alert Concepts **Hanford** Mid Valley Automotive **Hayward** Autohaus, Automotive **Hemet** Auto Sound **Hollywood** Car Fidelity **Huntington Beach** Henry's Auto Stereo **Indio** Auto Sound **Inglewood** Al & Ed Autosound **Center La Mesa** Mad Jacks **Lafayette** Creative Car Stereo **Laguna Beach** Laguna Stereo **Lancaster** California Sound Works **Larkspur** Marin Auto Stereo **Lawndale** Al & Ed Autosound Center, Crazy Stereo **Livermore** Piersons, Car Stereo **Long Beach** Long Beach Auto Radio **Los Altos** Dealer Car Stereo **Los Angeles** Al & Ed Autosound Center, Auto Stereo Warehouse, B&M Electronics, Beverly Hills Auto Stereo, Columbia Auto Stereo, Electronic Entertainment, Florence Car Stereo, Fujiden, Parts Audio, Rodeo Auto Accessories **Lynwood** Century Auto Stereo **Manteca** Pierson's Car Stereo **Merced** Sound Encounter **Mission Viejo** Century Auto Stereo **Modesto** Paradyme **Montclair** Whistle Stop **Monterey Park** Al & Ed Autosound Center **Moreno Valley** Auto Sound **Napa** Autohaus Automotive N **Hollywood** Al & Ed Autosound Center, Car Fidelity, Sound Factor **Norco** Auto Sound **Oakland** Auto Radio Headquarters **Oceanside** Mad Jacks **Orange** Henry's Mobile Electronics, Speakerworks Mobile **Palm Desert** Auto Sound **Palm Springs** Auto Sound **Pasadena** Al & Ed Autosound Center **Pomona** Auto Sound **Porterville** Perfect Sound **Redding** How's That Sound **Reseda** Auto Sound Engineering **Riverside** Auto Sound **Rolling Hills Estates** Palos Verdes International **S. Lake Tahoe** El Dorado Audio **Sacramento** Paradyme, Stereo Showcase **Salinas** D&R Car Stereo **San Bernardino** Auto Sound **San Carlos** Auto Sound Specialist **San Diego** Mad Jacks, Radio Man **San Francisco** Peter's Auto **San Jose** Century Stereo, Dealer's Car Stereo **San Luis Obispo** Car Stereo Stores **San Mateo** Pan Auto Sound **San Rafael** Marin Auto Stereo **Santa Ana** Henry's Auto Stereo **Santa Barbara** Creative Stereo, Santa Barbara Auto Stereo **Santa Cruz** House Of Sound **Santa Maria** Creative Stereo, Lombards Electronics **Santa Monica** Al & Ed Autosound Center, Car Fidelity, Safe + Sound **Santa Rosa** Santa Rosa Cartunes **Seaside** Kar Tunes **Sherman Oaks** Al & Ed Autosound Center, Andy's Auto Radio **Simi Valley** Soundtique Auto Stereo **Stockton** Paradyme Consumer Electronics, Rolling Sounds **Susanville** Electronic Butterfly **Thousand Oaks** Oaks Auto Radio **Torrance** Installations Unlimited, Parts Audio, Speakerworks, Mobile **Ukiah** Music Hut **Upland** Classic Motoring **Vallejo** Stereo Showcase **Ventura** Creative Stereo **Victorville** Incredible Sounds **Visalia** Lee's Stereo **W. Los Angeles** Al & Ed Autosound Center **Walnut** Transonic International **Walnut Creek** Walnut Creek Auto Radio **Whittier** Speaker works, Whittier **Woodland** Jerry's Auto Stereo **Yuba City** Jerry's Auto Stereo **Yucca Valley** Car Stereo Specialties

COLORADO **Arvada** Soundtrack **Aspen** Main Street Music **Aurora** Soundtrack **Avon** Mountain Music **Boulder** Listen Up, Soundtrack **Colorado Springs** Sight & Sound, Sound Shop **Denver** Listen Up, Soundtrack **Ft. Collins** Audio Junction **Glenwood Springs** Stereo Unlimited **Grand Junction** The Sound Company **Greeley** Soundtronix **Littleton** Soundtrack **Pueblo** Soundtronix **Steamboat Springs** Yampa Valley Sound Co **Sterling** Kaned Sound Emporium **Thornton** Soundtrack **Vail** Mountain Music

CONNECTICUT: **Avon** Hi Fi Stereo House of Avon **Canton** Jo-Di's Sound Center **Danbury** Carston Stereo **East Berlin** Cartunes **Enfield** Jo-Di's Sound Center **Fairfield** Audiodesign **Glastonbury** Audiofidelity **Greenwich** Auto Sounds **Groton** Lesser Sound **Hartford** Jo-Di's Sound Center **Manchester** Jo-Di's Sound Center **Milford** Installation Unlimited **New Haven** Audio Etc , Champion Auto Safety **New London** Jo-Di's Sound Center **Newington** Hi Fi Stereo House **North Haven** Jo-Di's Sound Center **Norwalk** Audiotronics, Jo-Di's Sound Center **Norwich** Lesser Sound **Old Greenwich** Audiocom **Stamford** Fairfield Stereo **Stratford** West chester Stereo **Waterbury** Jo-Di's Sound Center **Waterford** Tweeter, Etc **West Hartford** Jo-Di's Sound Center **Westport** Westchester Stereo

DELAWARE: **Dover** Sound Studio **Newark** Sound Studio **Wilmington** Sound Studio

FLORIDA: **Boca Raton** Vern's Electronics **Bradentom** Stereorama **Brandon** Stereorama **Clearwater** Stereorama **Coral Gables** Florida Car Sounds, Sound Advice **Ft Meyers** Stereo Garage **Ft. Lauderdale** Sound Advice **Ft. Pierce** Sound Shack **Ft Walton Beach** Professional Auto Radio **Gainsville** Couch Electronics **Hialeah** Walder Electronic **Hollywood** Sound Advice **Jacksonville** Audio Tech, Audio-Tech Regency, Discount Sound, Discount Sound Jackson **Maitland** Hi Fi Center **Lake Wales** Carousel Records **Lake Worth** Audio Advisors **Lakeland** Carousel Records **Longwood** Audio Garage **Marathon** Sound Source **Miami** Florida Car Sounds, Las Fabricas, Metro Electronics, Olson Electronics, Preston Electronics, Sedona Electronics, Sound Advice, Sunday Electronics, Sympathetic Ear, Walder Electronic **N. Miami** Cartronics **N. Miami Beach** Sound Advice **Naples** Stereo Garage **Newport Richey** Stereo Specialties **Orange Park** Audio Tech **Orlando** Audio Garage **Panama City** Watt sound Stereo **Pascola** All Pro Sound **Pinellas Park** Car Stereos Unlimited, Stereorama **Rockledge** Car Radios, USA **Sarasota** Stereo rama **S. Daytona** The Car Stereo Company **St. Petersburg** All States Radio **Stuart** Fox Audio **Sunrise** Sound Advice **Tallahassee** The Stereo Store **Tampa** Sound Advice, Stereorama Of Tampa **Vero Beach** Audiohouse **W Palm Beach** Sound Advice **West Melbourne Street** Sound **Winter Haven** Carousel Records, **Winter Park** Audio Garage

GEORGIA: **Atlanta** American Radio, Spectrum Sound, Stereo Design, Augusta Stereo Of Georgia **Brunswick** H & H Service Store **Chamblee** American Radio **Cornelia** Vaughn Music **Dalton** Sound Service Inc **Decatur** American Radio **Dublin** Word Hi Fi **Gainsville** Electronic Sales, **Jesup** Radio Shack **La Grange** R T R Limited **Lawrenceville** Sound Pro **Lilburn** Sound Pro **Macon** Ken's Stereo Junction **Marmetta** American Radio **Milledgeville** World Hi Fi **Rome** World Hi Fi **Roswell** American Radio **Savannah** Radio Tape Center, Southland Sound **Thomasville** Hi Fi Sales & Service **Tifton** Bergers Audio & TV **Valdosta** Stereo Connection **Warner Robbins** World Hi Fi Electronics, Kens Stereo Junction

HAWAII: **Aea** Electronic Entertainment **Hilo** Hilo Audio **Honolulu** Auto Audio, Electronic Entertainment, Island Sound Inc. **Kahuku** Electronic Entertainment **Kailua** Car Tunes **Lihue** Auto Systems, Kauai Wakuku Electronic Entertainment

IDAHO: **Boise** Sound Pro **Coeur D' Alene** American Television **Idaho Falls** Private Car Stereo **Lewiston** Steiner Electronics **Moscow** Aspen Sound Inc **Nampa** Jamison's Music **West Pocatello** Phase Four **Twin Falls** Audio Warehouse

ILLINOIS: **Algonquin** Team Electronics **Alsip** Car Tronics **Alton** Reliable Stereo & Video **Aurora** Stereo Systems, **Belleville** Audio Musicale **Buffalo Grove** Columbia Audio Video **Carbondale** Naider's Stereo **Champaign** Good Vibes Sound **Chicago** Automotive Sound Systems, Capitol Service, United Audio Centers, **Danville** Bud's Car Stereo **Decatur** Apple Tree Stereo **Deerfield** United Audio Centers **DeKalb** Appletree Stereo **Downers Grove** Safecar **Elmwood Park** Finishing Touch Car Care **Highland Park** Autosonics, Columbia Audio Video **Jacksonville** Music World 1st In Video **Joliet** Stereo Systems **Kankakee** The Shoppe **Lansing** Unitek Electronics **Moline** Ram Automotive **Morton Grove** United Audio Centers, **Mount Prospect** Mobile Music **Mt Vernon** Dons Stereo & Speed Center **Naperville** Stereo Systems **Niles** United Audio Centers **Normal** Appletree Stereo **Palatine** Auto Sound **Peoria** Team of Peoria **Quincy** Music World 1st In Video **Rockford** Appletree Stereo, Columbia Audio Video **Spring Valley** Audio Labs **Springfield** Sundown One **St. Charles** Autobahn Services **Sterling** Sterling Electronics **Vernon Hills** United Audio Centers **Villa Park** Hi Fi Hutch **Westmont** Sounds Deluxe

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KANSAS: **Arkansas City** Sparks Music **Dodge City** Cartunes Emporia Audio-Video Connection **Garden City** Team Electronics, Inc **Great Bend** Audio Electronics **Hutchenson** Hayes Sight & Sound **Lawrance** Kiefl's Record & Stereo **Manhattan** Rolling Thunder **Overland Park** Brands Mart Stereo, Santa Fe Auto Sound **Topeka** Nelson's **Wichita** Rolling Thunder

KENTUCKY: **Bardstown** Mr Music **Bowling Green** Poston Electronics **Corbin** Sounds Around Town **Elizabethtown** Replay **Florence** Sight In-Sound **Lexington** Superb Sound Lexington, Inc **London** Sounds Around Town **Louisville** Music City, Sound Factory **Murray** Sunset Blvd Music **Owensboro** Risley Electronics **Paducah** Risley Electronics, Stereo Advice **Prestonsburg** Audio Connection **Prestonsberg** B&W TV Appliance

LOUISIANA: **Baton Rouge** David's Car Stereo & Comm , Gonzales Music Center, Music Center **Gretna** Campo Appliance, Stereo Village **Hammond** Audio One **Lafayette** Ricky Smith Audio, Sound Electronics **Lake Charles** Classic Audio Systems **Mandeville** Campo Appliance **Monroe** Sound Center **New Iberia** Village Sound Center **Ruston** Music Mart Corp **Shreveport** Stereo & Record Center **Slidell** Gonzales Music Center, Campo Appliance

MASSACHUSETTS: **Ashland** Creative Car Stereo **Billerica** Mobile Automotive **Boston** Nantucket Sound, Tweeter, Etc **Braintree** Nantucket Sound, Tweeter, Etc **Brockton** Soundtrack Audio **Burlington** Tweeter, Etc **Cambridge** New England Audio, Tweeter, Etc **Chestnut Hill** Tweeter, Etc **Danvers** Richs Car Tunes, Tweeter, Etc **Dedham** Tweeter, Etc **Fitchburg** Music Forum **Framingham** Natural Sound, Tweeter, Etc **Framington** Auto Stereo Place **Gardner** Music Forum **Greenfield** Long Radio, Music Store **Hyannis** Nantucket Sound, Tweeter, Etc **N Attleboro** Audio Concepts **N Dartmouth** Riches Auto Radio **Northampton** Long Radio **Norwood** Northeast Security & Stereo **Pittsfield** Taylor'd Sound Gonzales Nantucket Sound **Saugus** Nantucket Sound, Northeast Security & Stereo **Shrewsbury** Lerser Sound, Rayco Car Service **Springfield** Long Radio Of Springfield **Stoneham** Auto Sound North **Waltham** Waltham Camera & Stereo **Wayland** Beaconwood Acoustics, Car Tunes.

MAINE: **Bangor** Radio City **Camden** Harbor Audio & Video **Lewiston** Radio City **S. Portland** Great Northern Sound Co

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MINNESOTA: **Alexandria** Audio Concepts **Baxter** Stereo 1 **Bemidji** Team Electronics **Brooklyn Center** Audio King **Burnsville** Audio King **Duluth** Stereo 1 **Edina** Audio King **Fairmont** Midwest Satellite Audio & Video **Fargo** Stereo 1 **Fergus Falls** Team Electronics **Golden Valley** Audio King Car Stereo **Center Grand Rapids** Team Electronics **Hibbing** Team Electronics **Hopkins** Transportation Electronics **Maplewood** Audio King Car Stereo Center **Minneapolis** Audio King **Minnetonka** Audio King **Roseville** Audio King St **Louis Park** Audio King Electronics **St. Paul** Audio King **St. Cloud** Stereo 1 **Virginia** Team Electronics **Wilmar** Sound Image **Winona** Amalgamated Audio

MISSISSIPPI: **Columbus** Audio Advantage **Greenville** Cartunes **Gulfport** Campo Appliance, Empress Of Mississippi **Hattiesburg** Hi Fi Crursin' Jackson Automotive Audio **Laurel** Hi Fi Crursin' McComb Custom Audio **Natchez** Sound Circuit **Oxford** Sights & Sounds **Pascagoula** Empress Audio & Video **Toledo** Audio Advantage **Vicksburg** Sound Circuit

MISSOURI: **Cape Girardeau** Stereo One **Columbia** D&M Sound **Kansas City** Brands Mart Stereo **Kirksville** Wrights Stereo Shop **Knob Noster** Gambles **Lebanon** Sight & Sound **Poplar Bluff** American Hi Fi **Rolla** End Of The Rainbow **Springfield** House of Sound St. Louis Hi Fi Fo Fum, Sound Central **West Plains** Hubert's Radio & TV

MONTANA: **Billings** Sound Pro **Bozeman** Sound Pro **Butte** Ossello's, Inc **Great Falls** Rocky Mountain Hi Fi, Sound Pro **Havre** Northern Electronics **Helena** Sound Pro **Kalispell** Logical Choice **Missoula** Electronic Parts

NORTH CAROLINA: **Asheville** Mr Toads **Chapel Hill** Stereo Sound **Charlotte** Carolina Car Stereo, Sound Systems **Concord** Audiohaus **Durham** Dashboard Stereo, Vickers Audio **Fayettiville** Sound Systems **Goldsboro** Pro Sound **Greensboro** Audio Video Concepts, Sound Systems, Stereo Sound Goldsboro Pro Sound Company **Greenville** Todd's Stereo Center **High Point** Audio Video Concepts **Jacksonville** Onslow Audio Center **Kinston** Stereo Concepts **Morehead City** Anderson Audio **Morganton** Macs TV **New Bern** Anderson Audio **Raleigh** Audio Express **Roanoke Rapids** Today's Electronics **Rocky Mount** Microwave World **Wilmington** Atlantic Audio **Wilson** Modern Stereo **Winston Salem** Stereo Sound, Audio Video Concepts, Custom Car Hi Fi

NORTH DAKOTA: **Bismark** Pacific Sound **Dickson** Music Hut **Grand Forks** Team Electronics **Jamestown** Music Corner **Langdon** Easy Way **Minot** The Stereo Shop **Williston** Team Electronics

NEBRASKA: **Kearny** Midwest Audio **Lincoln** Stereo West **N. Platte** US Tech **Norfolk** Mid City Stereo **Omaha** Custom Electronics, Stereo West **York** Midwest Audio

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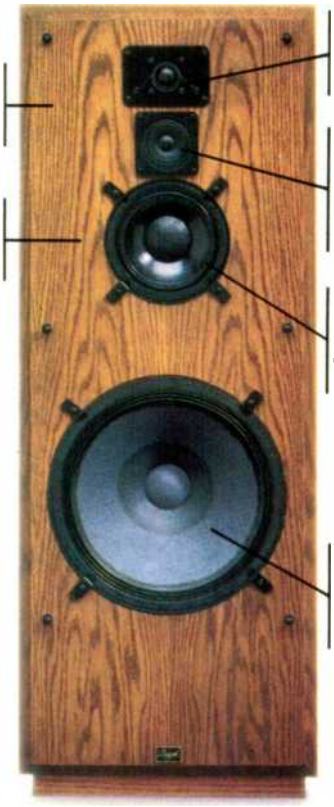

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If this record holds no surprises, still every performance is seamless, as Sonny Rhodes focuses on familiar material with pinpoint accuracy.

past with the technology of the future. Delicate Japanese shakuhachi music mixed with Kitaro's electronic influences: The romantic synthesized orchestrations of Vangelis and the deep-space journeys of Klaus Schulze.

Now, more than a dozen albums later, Kitaro is still doing it. Taken on its own, *Tenku* is magnificent. Kitaro bends synthesizer technology in strangely delicate and subtle ways, obtaining a nuance of expression that few can match. His Asian melodies, bolstered by thickly layered harmonies, are tinged with melancholy.

However, among the romantic cosmic feelings that Kitaro evokes is a sense of *déjà vu*. I've heard it all before; Kitaro has not altered his approach since *Ten Kai*, recorded more than eight years ago. Wave and wind sounds, sample-and-hold twinkles, majestic cadences—they've become worn clichés of the New Age.

The *déjà vu* is compounded by the simultaneous release and re-release of Kitaro's entire catalog in the West within the last two years. Kuckuck and Gramavision have duplicate issues of Kitaro's works. Geffen Records added to the confusion by re-titling many of the LPs, compiling others, and issuing them all in generic "New Age" covers. Suddenly the rare and precious artifacts have become interchangeable commodities.

Tenku, however, is the first new and original Kitaro LP released in the U.S. If you're buying you're first Kitaro record, this may be the one to get. It's his first full-digital recording, and the technology lends his airy soundscapes a new depth unimpaired by the hiss and fader noise of earlier discs.

Kitaro is a master composer of this unwieldy mélange called New Age music. His sense of melody and orchestration makes even his most banal works compelling, but for someone who has followed his music for a number of years, the view is becoming painfully familiar. *John Diliberto*

Albert King

The Lost Session: Albert King
Stax MPS-8534, $8.98.

Sound: B– Performance: B

Headline: Early '70s blues boom finds Albert King produced by John Mayall. Unfortunately, Mayall was going through his jazz period at the time and didn't produce the blistering crossover album Stax wanted, so the tapes were scrapped. They were rediscovered after Stax was bought by Fantasy, and actually aren't bad at all, if a little on the laid-back side. King plays some mean guitar, and his lyrics on "Money Lovin' Woman" are humorous. It's not exactly mind-blowing, but Albert runs through some interesting licks. *Jon & Sally Tiven*

Just Blues: Sonny Rhodes and The Texas Twisters
Rhodesway 4501, $8.98. (Available from Rhodesway Productions, P.O. Box O, 2124 Kittredge St., Berkeley, Cal. 94704.)

Sound: C+ Performance: B

Sonny Rhodes and his brethren are the lifeblood of the blues, keeping it alive in small clubs scattered around the country. Rhodes is neither a strikingly original guitarist nor singer, but *Just Blues* is a more satisfying set than recent releases by numerous better-known bluesmen. If this disc holds no surprises, still every performance is seamless.

Rhodes focuses on familiar material with pinpoint accuracy. "It Hurts Me

Too" typifies just how well Rhodes works his magic. The world probably doesn't need another version of this Elmore James warhorse, but Rhodes' interpretation so successfully evokes the cutting beauty of the original that you can't help but cheer him on. His lap steel guitar (a form of slide) responds to every line of his moving vocal, while The Texas Twisters toe the fine line between supporting and overpowering a bandleader.

Rhodes is at his best, though, on fresher songs. "Think" is a near-perfect performance of the sort that used to be released as a treasured 45, with an inventive lyric and crisp Freddie King-style lead guitar over a potent bed of horns. In fact, all of these tracks feature an undercurrent of horns, a legacy from Junior Parker, for whom Rhodes was once a valet.

Rhodes has stated in interviews that he sees himself as a blues ambassador, and this is a set from a man with a mission. *Just Blues* credits him as co-producer, co-arranger, singer/guitarist, and songwriter, and it has been issued on his own Rhodesway Productions, a virtual guarantee of continued obscurity for this young Oakland bluesman. On a better distributed label with more original material, Rhodes would surely find an appreciative audience for his mainstream blues. Until then, *Just Blues* will do just fine. *Roy Greenberg*

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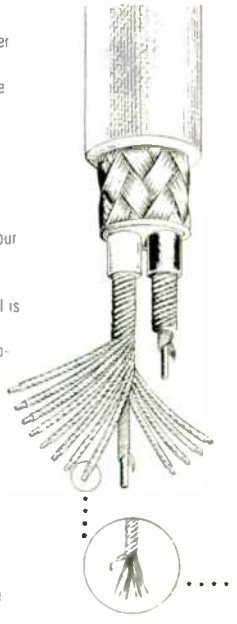

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Frequency Response	45-25000 Hz
Woofer Type	6" Dia., 3" Aluminum voice coil
Tweeter Type	Soft dome, Aluminum voice coil
Ferrofluid Cooling/Damping	Yes
Impedance	4 ohms
Sensitivity 1W/1M	91 db.
Magnetic Structure Weight	2.3 lbs./1.05 Kgs.
Dimensions	160mm/6¼" Dia., 67mm/2⅝" Depth
Mounting Depth	53mm/2⅛"
Net Weight	2.85 lbs./1.3 Kgs.
Front Grill	Integral metal grill

INTEGRA-2 MkII
Integrated 2-way 8" / Dome Tweeter (Adapted for bi-amp)

Power Handling Capacity	120 Watts RMS
Frequency Response	35-25000 Hz
Woofer Type	8" Dia., 3" Aluminum voice coil
Tweeter Type	Soft dome, Aluminum voice coil
Ferrofluid Cooling/Damping	Yes
Impedance	4 ohms
Sensitivity 1W/1M	92 db.
Magnetic Structure Weight	2.3 lbs./1.05 Kgs.
Dimensions	220mm/8⅝" Dia., 75mm/3" Depth
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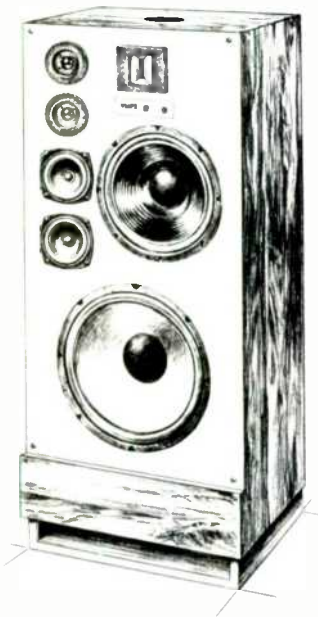

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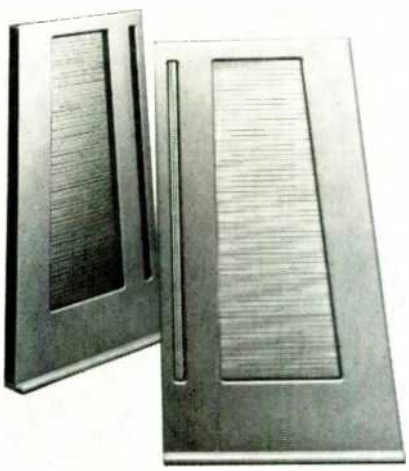

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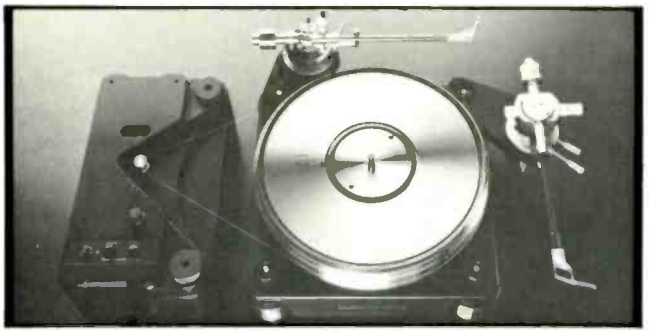

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