Profile: MODERN PROPUES HONE RECORDING BONES HONE RECORDING E MUSIC

ICD 08560 \$1.95

Vol. 7 No. 4 January 1982

DHA COUGAR

11100 1

The Studio Business

LAB REPORTS:

Denon DH-510 Open-Reel Recorder

Nakam chi 70C ZXL Cassette Deck

Sounderaftsmen AS1000 Frequency Spectrum Real-Time Analyzer

NOTES: Vocoder Round-Up



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NEW PRODUCTS

RECORD REVIEWS

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Providing extended delay times at an affordable price, the new MXR Model 151 Delay System II gives you over three full seconds of delay (three times that of similarly-priced digital devices). Specifically, the Delay System II can offer you up to 800 milliseconds of clean, quiet delay etera full 16 kHz bandwidth (over 200 milliseconds more than the closest competitor). As a digital recorder the Delay System II's exceptional memory capability lets you capture entire musical phrases or obtain a wide variety of dynamic and *musical* studio-quality effects from flanging and chords to echo and doubling in one rugged package.

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Next, convince him that you need some basic features like individual input channel patching, phantom power, input attenuation and padding, two effects sends, and overload indicator lights. Remind him that you would like at least a four-way, independent mix for headphones in the studio or for monitors on stage. Tell him that you would like the mixer's submasters to be an independent mix from that of the masters, so that a tape can be made of a live gig without disturbing the P.A. mix.

Don't forget to tell the salesman that you must have a full parts and labor warranty for at least two years ... one which enables you to deal directly with the factory if you like when your band is not near a local dealer.

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JANUARY 1982 VOL. 7 NO. 4

MODERN RECORDING & MUSIC

THE FEATURES

IS THIS A STUDIO OR A PAPER FACTORY?

By James F. Rupert **32** Granted, record keeping can turn your studio into a parchment igloo, but *not* keeping records can put you out of work

keeping records can put you out of work quicker! Rupert's solution will make your studio a better place for you and your clients.

THE STUDIO BUSINESS

By Murray R. Allen

A hard look at some of the motivations and priorities involved in starting—and making a success of—a studio in these less than supportive economic times. Keep in mind that ultimately, heart and head can prevail!

A SESSION WITH JOHN COUGAR

By Jon Marlowe

Dreams come in all shapes and sizes: To John Cougar, just making a record was *it*. To Mack Emerman, the completion of a ninesided, state-of-the-art studio was a 27-yearold dream. Find out what happens when Cougar's raw, gutsy R&R hits Emerman's multi-million dollar teak dream studio.

PROFILE: PRODUCER BONES HOWE

By Bob Anthony

Highlighting his current work with Tom Waits, Howe discusses the career that began in 1957 as a \$72.00 a week job as an apprentice engineer, took off with the hit "Purple People Eater," and has no end in sight.

COMING NEXT ISSUE! Recording with Ray Davies Profile: Split Enz Recording Techniques, Part I

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Cover Photo: Dan Littlejohn Cougar Photos: Dan Littlejohn Howe Photos: Bob Anthony



WHY SPEND \$200 MORE **ON A BETTER TAPE DECK** WHEN ALL YOU NEED IS \$2 MORE FOR A BETTER TAPE. Maxeli, xlis 90

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IIIEXEII. M. 19 No matter how much you spend on a tape deck, the sound that comes out of it can only be as good as the tape you put in it. So before you invest a few hundred dollars upgrading your tape deck, invest a few extra dollars in a Maxell XLI-S or XLII-S cassette.

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REAL DALLING

Letters to the Editor

The Tracks of Our Tears

Your series on multi-track recording by Craig Anderton contains some serious misinformation.

A $\frac{1}{4}$ track stereo head is no more "compatible" to a four track recorder than a 2 track machine would be, and is not as good.

His suggestion to try and sync up the two machines is really fanciful. I have done it with two Ampex halftrack decks, both very expensive, but I have also wasted hours of time trying to get them in sync.

The chances of being able to sync up a four track, say a Teac 3340, and ANY so-called home recorder, ¹/₄ track are slim or none. For one thing, the vast majority of the ¹/₄ track machines have no way to cue up the start, no way to rock the tape and get it exactly in the right speed.

For the money spent on a good four track, and a good ¹/₄ track, you would be better off going to an 80-8 Teac, or other 8 track machines.

In another article, he says to put four horns on to a ¹/₄ track from the four track, *leaving the click track out*.

Forget it; without a click, or a drum, how will the player know the duration of a four bar rest? This advice is pure fantasy. You can put three tracks on one side of the ¹/₄ track, but the drum or click MUST be on the other one, and remain until not needed or replaced.

I am a professional musician with 40 years of recording experience, from wire through 24 track, and when he speaks of "punching in" on a home $\frac{1}{4}$ track recorder of a tune with a rhythmic beat, he is giving very bad advice.

Love your magazine. Peace

-Gordon Jenkins Malibu, CA

Craig Anderton responds:

There is no misinformation in the "Multi-Track Magic" series as a rereading of the articles will show.

 $\frac{1}{4}$ track and 4 track compatibility: There is a *great* deal of difference between the track configuration of a $\frac{1}{4}$

ble with a 1/4 track head but not with a 2 track head. A 2 track head records each track over .080" of tape, with these 2 tracks spaced .156" center to center and placed symmetrically about the center line of the tape. A 1/4 track head records each track over .043" of tape, with the two tracks spaced .136" center to center but, unlike a 2 track head, offset with respect to the center of the tape. A 4 track head designed for 1/4" tape is so designed that a tape recorded on a quarter-track machine may be played on a 4 track machine, with the left and right channels of the 1/4 track tape appearing on tracks 1 and 3 of the 4 tracks. If there is material recorded in the other direction on the 1/4 track tape, that material will show up on tracks 2 and 4 of the 4 track, but in reverse. Conversely, tapes recorded on tracks 1 and 3 of a 4 track machine will play back as right and left channels on a 1/4 track tape. These different formats are therefore compatible in the sense of being able to transfer tapes from machine to machine to add overdubs (the playback EQ curves of the two machines might not match up perfectly, but that's what equalizers are for). For additional information on this subject, see the diagram on page 34 of MR&M, July 1981 issue (the captions for the two figures are reversed, but the numbers are correct) or any good reference book that gives the dimensions of various tape recording head formats. You'll see that 4 tracks and 1/4 heads are indeed compatible, at least for the purposes outlined in the article.

track and 2 track head, which is why a

4 track machine is said to be compati-

Machine to machine sync: Perhaps you didn't read this section carefully enough, which states that you need variable speed in order to adjust for any timing errors, and that if you didn't have variable speed, you would have to do numerous splices of those sections that did sync up correctly. I never said this would be easy, but I do say it's possible and have several pieces of music to prove this. I've used

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hand synching between a TEAC 3340 and Otari 505-8 to add on vocal choir overdubs, place a "barber pole" synthesizer undercurrent underneath a solo, and do true tape flanging of an entire track (which means that you have to maintain a speed accuracy within 15 milliseconds). I noticed that the 3340 ran very, very slightly faster than the Otari, so from time to time, I'd just speed up the Otari a bit to compensate. Those remaining studios without speed control can do archaic things like press on the capstan to compensate for speed changes (by no means a recommended technique, but if it saves a session...).

As far as not being able to cue up a 1/4 track machine because you can't rock the tape and forth, cuing is again not easy (no sync trick is) but it is possible. The way I get around this is to stop the 1/4 track recorder on the beat (actually, I use a cassette deck, which makes this even harder). I then start it again in time with the music, and note how much delay there is. I then compensate by this amount next time I start the cassette machine; the sync is usually close enough so that I can resolve any timing errors with the variable speed control on the main deck. Sometimes you can make a mark on the tape to indicate a specific spot, and try moving the tape relative to this marker, trying to get closer to sync each time, until the tape starts off in the right place. Sure, you won't get it right the first time, but how many musicians get their parts laid down perfectly on the first try? Also, remember that you don't always have to do an entire song from start to finish. It might take four or five separate attempts, with each attempt completing another 30 seconds of the piece in question. And, not all transferred parts are necessarily rhythmic; backing tracks, sweetening tracks, and sound effects are rarely "tempocritical."

Another tip that most studios use is to not start a song without at least some kind of count-down or timing reference. I make mine extra-long, which gives me plenty of time to get the machines synched together and purring in harmony.

4 track $+ \frac{1}{4}$ track vs. 8 track: The point of the series was that the reader couldn't afford an 8 track. By the way, nowhere do I advocate getting a brand new 1/4 track and 4 track (in fact, I said that a 1/2 track gives the potential for better fidelity). I simply lay out the options. If a reader can pick up a 1/4 track reel to reel used for \$300 (not an uncommon price) to go with an already purchased 4 track, I want that person to know that the 1/4" will be useful in perhaps unforseen ways (like for doing the transfers mentioned in the article) as well as for mixdown. Not everyone, myself included, has two "expensive" 2 track Ampex machines, instead, we make do with what we have. An 8 track recorder is a lot harder to acquire than a 4 track and some reelto-reel to mix down on. Besides, even supposing that the two costs were roughly equivalent-which they certainly aren't-once that person has the 8 track, they STILL have to get something to mix down on to, which jacks the cost of that option up considerably.

Leaving the click track out: In the example to which you refer in the article, the click would HAVE to be left out since you would be bouncing in the non-sync mode. As far as not having a rhythm to follow along with, musicians are imaginative people and you can always phrase the horn parts rhythmically, record a tambourine or clave along with the horn part, process the horns synchrosonically, mix the reference click on to one of the horn parts at a low level when the horn is playing and at a high level when the horns aren't playing (after the parts are premixed, just erase those particular sections of the horn track where the horns aren't playing if you find the clicks offensive), or if all else fails and you want a pristine click track, settle for three horn parts and leave track 3 intact, while bouncing horn parts from 1 and 2 over to 4 in the sync mode...you get the idea.

The point of the "Multi-Track Magic" series, which if it was lost on you might have been lost on other patience, hard work, and other people as well, is that patience, hard work, and *above all*,

the entertainer. by TAPCO

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imagination and creativity will substitute for big-bucks equipment. These techniques all work; if you want to hear them in action, listen to my upcoming "Secret Stars are Shining" album.

> -Craig Anderton Contributing Editor Modern Recording & Music

Name That Tape

In our December 1981 Lab Report on the Sony TC-K777 cassette deck we did not mention that the tape which was supplied to Len Feldman for testing with the machine was designated UCX-S. The proper name for this tape was not available at press time, so we are bringing you that information now.

Missing the Point

Jon Gaines, the author of "Construction Project: Building a Noise Gate," which appeared in the November 1981 issue, brought to our attention that a grounding point was left out of the schematic diagram which appeared in that issue on page 34. The junction of



R9 and R27 should be grounded. We are re-running that diagram with the grounding point included, at his request.

Plate Reverb

In reference to a letter from Fred Langer in the November 1981 issue requesting information on plate reverbs, the *Audio Cyclopedia* has some general information concerning plate reverb construction. Although not exactly a "how to" article, it does give plate dimensions and a diagram showing driver and pick-up positions. Frequency response and reverberation times are also charted. The book is published by Howard Sams.

Like Fred, I too would like to build a plate reverb as I'm sure many of your readers would. I hope that this information will further the cause.

> —Tommy Byrd Creative Commercials Austin, TX

Songwriter

I'm writing to you because I have written a song, and would like to know how to go about getting it published. It is a religious song and has a western tune. I was wondering if you had an address where I could send the song to.

> -Gordon Swann St. Catherines, Ontario

I refer you to a letter published in the December 1980 issue of Modern Recording & Music. It is entitled "The Hunt For A Seller of Songs." In it we explain the procedures for finding the proper publisher for your song. You might want to make a recording of

ALL YOU NEED IS EARS

The memoirs of modern recording genius George Martin.

George Martin is the most famous producer in the music business. Working with such diverse stars as Judy Garland, the Bee Gees, Ella Fitzgerald, Cheap Trick, and The Beatles, he has constantly set new standards for the recording industry and redefined the relationship between artist and producer.

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your song, but I'll not go into that here. I suggest you refer to the abovementioned letter on page 4 of the December 1980 issue.

Help for Dokorders

We have received repeated requests for Dokorder's address so that those of you out there with Dokorder machines can have them repaired. We have two separate addresses, one for parts and information, and the other to send your machines to. Parts and Information: P.O. Box 8, Lawndale, California, 90260. Machines: 2720 S. Harbor, Santa Ana, Ca., 92704. We hope that this soothes those of you out there who have been struggling with machines that you thought no longer could be saved.

Roland of the East

I need the address of the Roland Musical Instrument Company of Japan. I also need to know the address of Vox Limited in the USA.

> —Asif Masood Siddiqui Karchi-I, Pakistan



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The address of Roland Musical Instrument Company of Japan is: 7-13 Shinkitajima 3-Chome Suminoe-ku Osaka, Japan 559 The address of Vox Limited is: 32 Gordon House Road London NW5 England

A Source

In the *Talkback* column of the August 1981 issue of *MR&M*, Steve Griffiths of Tasco Sound talks of an ITT Cannon multipin connector. I have been unable to locate a source for purchasing this item. Please advise me as to where I can purchased them. Thank you.

> -Ric Heidenescherl Adrian, MI

You can purchase the ITT Cannon multipin from Arrow Electronics, Inc. of Detroit at 3810 Varsity Drive, Ann Arbor, Michigan, 48104. Their phone number is: 313-971-8220. TWX is 810-223-6020.

Plenty of Horns

In reference to the letter entitled "Speaker" which appeared in the November 1981 issue of MR&M, we received the following letter, written by Mr. Young. "Speaker" referred to Mr. Young's first letter which appeared in the September 1981 issue, and here Mr. Young responds to Mr. Huff's letter.

I believe Mr. Huff's criticism of my speaker cabinet plan offer to be unfounded and offer the following as evidence:

First, I clearly state that the \$20-30 included more than simple plans. Unlike the free (or nearly free) plans offered by several speaker manufacturers, mine contain guidelines for finishing (choices and application), hardware selection, interfacing into systems and designing of systems, practical speaker cabinet construction techniques, historical information, etc. This information is not influenced by particular loudspeaker brands and is based on my experiences building cabinets for touring concert systems and other pro-audio applications.

Mr. Huff implies that there are only several "time proven" models or designs that deserve consideration by engineers/soundmen. While it is true that there are only several basic design

TDK SUPER AVILYN NOW MAKES OPEN REEL GO TWICE AS FAR.

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AB HUG METAL REEL

It's called Super Avilyn EE (Extra Efficiency) open reel. SA was specially developed for use with the new open reel decks with the Extra Efficiency EQ/bias setting. On these decks, this brand new formulation actually lets you record and play back at half the normal speed. And keep all the full, brilliant sound the finest open reel delivers. Which means that you get twice as much music from a single reel of tape as you could before.

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categories (folded horn, bass-reflex horn, etc.), for each category there are many variations that have been designed and they each have very distinct sound characteristics. The selection of a given design is just as much subjective as objective. Just as much psychoacoustical as mathematical. One man's ideal horn is another's PIECE OF GARBAGE.

I offer a large number of low and mid frequency horns which are not offered by anyone else, to my knowledge. There are some horn plans that were offered to some dealers at one time, but for the most part the plans available to the consumer are simple (to build), bass-reflex non-horns and quite often are not detailed enough to allow for factory equivalent construction. If the builder chooses, he can end up with a cabinet that outperforms (in most cases), looks as good as, and lasts longer than a factory built version with the information contained in my plan sets.

In closing let me suggest that the potential builder contact Mr. Huff and should they find that his files are limited and that he can offer little else than his free plans, they can write me for mine. Real experience is never free. If Mr. Huff wishes to continue his criticism, he can write me personally and save the magazine's time and space for more constructive exchanges.

> —Tom Young 171 Moreland Ave. Waterbury, Ct. 06705

Fine Filtering

In response to Mr. Joe Klee's record review (August 1981 issue) of the Isaac Stern 60th Anniversary album with Perlman, Zuckerman, and Mehta (CBS Masterworks), once again we find evidence of reviewers failing to understand the real benefits of digital recording.

Although his premise that the album was a recording free from the usual coughs, page turning, and foot shuffling was true, what he neglected to consider was the painstakingly conscientious editing work of an outstanding classical producer, Mr. Andrew Kazdin, who edited the album on the 3M digital system at Sound Ideas Studios, in under 40 hours of studio time. Mr. Klee's error was that he attributed the control of these extraneous noises to the fact that the recording was digital and did not realize that digital recording does not selectively filter room noise from program. Congratulations Mr. Kazdin, The New York Philharmonic, and CBS for a truly exceptional album.

> -Bob Schaffner Sound Ideas Studios Mgr. N.Y., N.Y.

In Defense

I have just received your November issue and read Mr. Soocher's review on George Harrison's *Somewhere in England*. Mr Soocher uses the same vague observations as are often used when tearing apart a new George Harrison album. That was no surprise.

What I did find "unsettling" were his value judgements, which he didn't bother to qualify. When one forms a conclusion he ought to present his premises.

Mr. Soocher describes "Blood from a Clone" as a gory parable. It ought to be.

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CIBCLE 61 ON READER SERVICE CARD

MODERN RECORDING & MUSIC

The reason being that Somewhere in England was originally kicked back from Warner Bros. for lack of commerciality. I would be upset too! Where is the art?

I have no idea what Mr. Soocher is talking about and it's just as well. Now I can go on enjoying Hari's album!

> -Tippy Prescott Virginia Beach, Va.

The Mysterious Beam Echo

We recently acquired what appear to be two rather ancient stereo preamps. From their markings I've learned that they are both Type SP21/2 "Beam Echo'' preamps. Their place of manufacture is noted as London.

We're interested in obtaining schematics and owner's manuals for these pieces, but have no mailing address for Beam Echo, nor are we even sure they are still in existence.

We've heard the English sense of humor is dry, but no address on the rear panel of equipment? Really.

Can you be of any help? We sure hope so!

> -Mike Froncek Yonkers, N.Y.

I'm afraid we don't know, either. But we ask any of you out there who do know to please write to us at Modern Recording & Music with whatever information you've got.

Is Neptune far from Mars?

I have been a reader of your magazine since 1978 and have found it an invaluable source of reference. Keep up the good work.

I am having a great deal of difficulty in locating the manufacturer of one of my boards. Perhaps you could be of some assistance. The board is the Performer Six amplifier and mixer. It is made by Malatchi Electronics Systems, Inc., Commercial Products Division, Denver, Colorado. Would you have their address?

> -Royston Belnavis Scarborough, Ontario

Yes, we do. Malatchi Electronics Systems is a part of BKL International Distributing Corporation, 1111 Green Grove Road, Neptune, N.J. 07753. Their phone number is 201-922-8600. Hope they can help you with what you need.



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CIRCLE 173 ON READER SERVICE CARD



"Talkback" questions are answered by professional engineers, many of whose names you have probably seen listed on the credits of major pop albums. Their techniques are their own and might very well differ from another's. Thus, an answer in "Talkback" is certainly not necessarily the last word.

We welcome all questions on the subject of recording, although the large volume of questions received precludes our being able to answer them all. If you feel that we are skirting any issues, fire a letter off to the editor right away. "Talkback" is the Modern Recording & Music reader's technical forum.

Seven on Eight

I have just purchased a Teac/Tascam 80-8 machine equipped with variable speed, and I am beginning to "venture out" and turn my "bedroom" studio into a money-making affair.

However, I have seven questions that directly concern the use of this new 8-track machine. Although I am very pleased with the choice that I've made—the performance of the deck far surpasses my expectations—I still feel a little unsettled using it until I receive answers to these pressing questions:

1) Why do the VU meters "dance" a little on unused channels during recording?

2) Is the whine of the DC servo motor that I had installed in place of the regular capstan motor normal? This supposedly "better" motor is noisier than the original one and the specs are *not* as good. How could this be? The original one seems to be larger and more quiet than this one installed for variable speed usage. Also, the original one, even though current induction, has a speed accuracy of .5%, while the booklet specs that came with the VSK-88 kit states that the replacement DC servo motor has a speed accuracy of only .7%! Does this mean that my "modified" machine is not as steady as a regular one?

3) Why can't you dub from, let's say, tracks 3, 4, and 5 down to track 2? This cannot be done at all, due to excessive feedback. Can this be done effectively on an 8-track machine that uses 1" tape?

4) This question concerns editing the multi-track tape without physically splicing the tape. What is the best method of doing this in the example I am about to give:

Track 1 contains a "reference" track made by an electronic drum machine. Tracks 2 through 8 contain all the rhythm, drums and vocal tracks. Before the tune actually begins, there are about 15 seconds of the click track on track 1, which is useless to the final result of the song. The tape footage meter on the 80-8 (and many other decks, for that matter) is not accurate enough to use in order to erase this part of track 1 just before the song (first note) actually begins because there is a chance that you might clip off part of that all-important first note. The only solution I can think of is for tape machines of the future (semi-pro ones, not 24-track decks with autolocators) to come with this footage meter broken down into fractions, with an arrow or indication marker to locate a spot of music that you can hear with your ears and then know exactly at what number on the meter to stop the transport after it has erased the unwanted part. As an example, let's say the footage counter is between 14 and 15 when the music on tracks 2-8 starts. This is not accurate enough, unless you could say 14³/₄, etc.

5) Is the tape noise that is heard while rewinding the tape causing excessive wear to my expensive 8-track heads? Does this mean that the tape is riding too closely over the heads, or is this noise normal? 6) Why does the overload peak LED flash on sporadically at times, even when the needle on the VU meter is riding consistently at a normal setting slightly less than 0 VU, and not at all going into the red area? Sometimes, when recording an acoustic guitar, the needle on the meter might occasionally go into the red area, but the overload indicator still might not go on! When I hook up a drum machine directly into the board, the overload light will go on constantly even when the level is set at -3 VU!

7) Are all tape head demagnetizers the same, in respect to the job that they are supposed to do? A recording engineering recently told me that the one I use (a Radio Shack brand) is not as good as some of the others available. Is this true?

> -Marc William Fallon "The Bedroom Studio" Teaneck, N.J.

Wow! Seven questions that could require a university course to answer! Well, within the limits of space we can share here, here goes.

1) Your VU meters reflect the signal volume being "seen" at the inputs of the reproduce amplifiers of the 80-8. When you witness them mimicking the movements of the meter for the channel you're recording on, you are looking at the result of the magnetic coupling in the record head. The record head is exhibiting transformer action because it is a transformer! Magnetic shields are built into the tape heads on all multichannel recorders, sandwiched in between the metal core sections of the head. Even so all transformers have frequency-dependent properties that cause crosstalk where their windings are in close proximity-indeed transformers depend on magnetic crosstalk to work as transformers. The bias, at 100 kHz, is easily coupled through the head's cores and windings, and is then

modulated by the audio present in the channel that's being recorded.

2) This question is really two questions in one. First the noise: the "whine" you hear is the frequency output of the motor tach and is in the kilohertz range close to the most sensitive range of hearing so it is possible that the motor is actually meeting spec but sounds noisier than the 60 Hz hum you get from the synchronous motor simply because the 60 Hz hum is harder to hear. Also, without knowing how the motor was installed, it's hard to tell whether the installation was carefully done or indeed if the individual motor you have is not an anomaly and is making too much noise. The original hysteresis synchronous motor is an outstanding motor for the money, but synchronous motors are fairly simple compared to servo motors, and asking for a servo motor of comparable quality to synchronous types means paying much more. This is not to imply that the VSK-88 is not a good motor, but every last dB, and every last tenth of a percent, will cost more and more, and there is a point where Teac chooses to leave specsmanship to people who can afford it, and defer to those who are satisfied with tools that do the job.

As far as speed accuracy is concerned. I spoke with the main Los Angeles Department of Water and Power Office and received assurance that the periodic accuracy of the power grid (from day to day) is usually 0.03% in frequency, but was unable to pin them down on the minute to minute variation. I then called a friend who has extensive background in powerline practice gained from his years as a staff researcher at Cornell University's facilities, and he confirmed my suspicions about the line frequency variance. I have recorded for many years with synchronous motor decks and have always noted with dismay, the fact that a piano recorded one day is often out of tune with its recorded image the next day. My researcher friend said, in no uncertain terms, that it should not be a surprise to see 0.33% variations in frequency on a transient basis or for short periods. The generators supplying the power to the lines have governors to regulate their speed and thus their output frequency. The governor is a device that tries to allow the generator to match the power drain by allowing it to speed up when taxed, and slow down when the load is lighter, the goal being



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to keep the generator going at the precise speed at all times. These governors are very good, and *very* expensive, but as good as they are, the massive turbines or water wheels and armatures of the generators can't respond to instantaneous changes in current demand such as those produced by lines switching on and off.

The load dispatch centers of the power companies use the Government's WWV radio signal from Fort Collins, Colorado, to coordinate the powerlines in systems called "grids" and these grids are corrected from day to day for the total *number of cycles* (86,400 per day).

If you run a synchronous motorequipped 80-8 on a laboratory test bench with its own controlled frequency standard, you will get a basic accuracy limited only by the torque curve of the motor and the tape tension changes as the reels exchange tape, and this tolerance in speed is the quoted 0.5% in the manual. However, if you take into account the variations that are likely on the power grids you will be plugged into, and add the 0.33% to the 0.5% you started out with, you will end up with a total speed accuracy of 0.83%, and you can't tune the tracks to the piano! The VSK, on the other hand, is not sensitive to the variations in powerline frequency, even thought there's some tolerance, its tolerance is due mainly to the effects of temperature variation within the motor and its related electronics. In order to get tighter tolerance limits, it becomes necessary to add circuitry like crystal oscillators, comparators, and/or optical encoders, as well as adding four times more horsepower to the motor for every doubling of accuracy-since the motor will need more power to "catch up" to the signals fed to it for speed correction.

We (Teac) actually appreciate our customers' desires to squeeze every bit of performance out of our equipment, and for the most part they do an amazing job of it, but the equipment performs so well in some cases (in some hands), that our dear customers forget how many decimal places are in the price!

3) On the subject of price, question number 3 is also a price related one. As many of our 80-8 users know, it is possible to do an adjacent track dub if

the input level is kept below the feedback point (a procedure we discourage). and many unsuspecting (and uninformed) 80-8 users go on doing this until the low record level and the noise prompt a frantic phone call to us only to be told that they have been succeeding with an error all along. It is not uncommon to see larger format machines capable of adjacent-track dubbing, but these machines' tape heads can cost as much as an 80-8! The actual reason you will run into feedback on the 80-8, is that there are several stages of bias trap filtering left out to reduce cost, and the narrow format head does not allow the same thickness of metal laminations to be inserted as a guard against intertrack bias leakage. Remember, there is always some price to be paid when a ten-to-one cost saving gets you the same number of tracks.

4) This is really pretty basic stuff. Your most satisfactory method of eliminating the "click," or a count-off, etc., is to let it play onto the half-track *master* and then use a demagnetized razor blade and an Editall splicing block to insert a section of paper leader

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This is not the onlyImage: Delta B. Image: Delta

As you can see from this frequency response curve, the new JBL 2441 delivers impressive levels of performance. From extended bandwidth to high sensitivity and smooth, peak-free response.

But as important as these performance parameters are, they're only part of the story. Using the latest laser holography and computer analysis techniques, JBL engineers have developed a unique diaphragm design that allows the 2441 to match its outstanding response with unprecedented reliability and power capacity. That means you get exceptionally high performance without the trade-offs found in previous driver designs.

The secret behind this increased performance lies in the diaphragm's three-dimensional, diamond-pattern surround.¹As outlined in a paper

Specifications		
Horn Throat Diameter	50 mm	2 in
Nominal Impedance	16 Ω	
Power Capacity	70 W contin	uous program
Sensitivity (1 watt. 1 meter)	111 dB SPL (on axis of a JBL 2350 90° radial horn)	
Frequency Range	500 Hz to 18 kHz	
Voice Coil Diameter	100 mm	4 in
Voice Coil Material	Edgewound aluminum ribbo	
Flux Density	1.8 T (18 000 gauss)	

published in the Journal of the Audio Engineering Society,² this surround is both stronger and more flexible than conventional designs. This permits the diaphragm to combine all the traditional reliability and power capacity benefits of its aluminum construction with the extended frequency response of more exotic metals. It also maintains consistent diaphragm control throughout the driver's usable frequency range to eliminate uncontrolled response peaks.

Additionally, each 2441 is built to JBL's exacting standards. The magnetic assembly is machined from rugged cast iron and steel. Extremely tight machining tolerances and hand tolerance matching maintain unit to unit consistency. And finally, each 2441 is individually tested to ensure that it meets published specifications.

So before you buy any compression

driver, ask your JBL professional products dealer about the 2441. It'll deliver a lot more than just an impressive frequency response.

1. Patent Applied For

2. Journal of the Audio Engineering Society, 1980 October, Volume 28 Number 10. Reprints available upon request.

James B. Lansing Sound, Inc. 8500 Balboa Boulevard, Northridge, California 91329 U.S.A.

> JBL's diamond suspension diaphragm cortbinez performance with veliability.

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IJBL

Professional Products Division tape between tunes. This is the method almost universally used in recording studios. Your suggestion of precision footage counters is great—for counting footage, but experienced recordists would not use them as you suggest, rather they would continue to trust the trustworthy razor blade.

5) If you are hearing sound anywhere near as loud as the sound you hear playing the tape, you undoubtedly have the *cue lever* locked in its up position and this will accelerate head wear *drastically*! If the sound from fast winding the tape is at a lower level, and muffled in the treble, then you are only hearing the sound of the magnetization on the tape as it runs past the heads in proximity, and the tape lifters are doing their job.

6) The overload L.E.D. indicators on the 80-8 are factory preset to fire at +10 VU and are adjustable.

There is a term, *Crest Factor*, found commonly in audio which bespeaks the fact that sounds are made up of complex variations of pitch, volume, and *silence*. The silence is very important, because it is part of the overall amount of energy in a given space of time. As you know, when you strike a single note on a piano and hold down the key, the note first sounds loudly, and then dies away or decays, rapidly at first, and then more and more gradually. This is also true for sound produced by instruments that are plucked, struck, or whose sound is otherwise initiated by sudden action. The instantaneous first "crest" of sound can be measured and assigned a value or number usually in dB or VU, and of course, the subsequent decaying portion of the sound can be measured and given a value for its average volume. What you end up with given these two values, is a so-called "peak to average ratio," or crest factor. Sounds such as those made by drums, especially closed hi-hat, and acoustic piano can have crest factors of 40 dB, which means that the initial strike sound will be 40 dB louder than the average volume of the note. Given this, and the fact that these percussive sounds are fast or "transient," allowance must be

made for the meter needle's slowness. The needle on the meter, and the armature of the meter's movement, have mass, and mass is what keeps the meter from reacting instantaneously. As it turns out, the meter is great for monitoring either slowly occurring sounds or steady tones, but can miss fast sounds altogether—for instance, an electronic pulse like a metronome click might actually fire the overload indicator without having any meter movement at all!

Novice recordists often experience this phenomenon when using a recorder with no overload indicator. The click track is printed on a track so that a meter indication is made, and since the click is short, the ear does not perceive the gross distortion from the severe overload. When the tape is played back, the click has bled into all the other tracks because it has so totally overloaded the machine's recording electronics.

For years, the audio community has tried to improve the capability of recording devices to record "silence,"



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Which means we knew what we were doing when we designed this high-speed transport drive for 7" reels.

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And we didn't sacrifice an inch of quality to get you up to speed. Have a look.

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Wow and Flutter (Teac Test Tape YTT-2004): 0.07% peak (IEC/ANSI weighted), 0.10% peak (IEC/ANSI unweighted), 0.04% RMS (NAB weighted), 0.07% RMS (NAB unweighted). Frequency Response* Record/Reproduce 0 dB referenced to 1 kHz: 40Hz-22kHz ± 3dB at OVU, 35Hz-25kHz at -10 VU.

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© 1981 TEAC Corporation of America, 7733 Telegraph Road, Monteledio, CA 90540 "Teac Test Tape VTT-8013

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so that the overall recording level of the sounds recorded could be lowered, allowing the peaks to be captured cleanly—within the operating range of the recorder—but far enough above the noise intrinsic to the recording process to be heard as free of noise contamination. Within the last decade, Dolby and dbx have come into widespread use as a means of lowering the noise enough to enable recording the sound at a lower record level. In the last few years we have witnessed the advent of digital recorders which also give more desirable noise performance while lowering distortion dramatically.

7) The job of a tape head degausser is to demagnetize tape heads. I imagine all the degaussers on the market were made with the honest intent to that end. The main differences are the mechanical arrangement of the coil and the poles, and the output strength of the units. There are better and worse than the unit you describe. The strongest unit I know of is the "Annis Handi-mag," a brute of a unit capable of doing what yours does from an inch away! You can even bulk-erase tape with the back end of the Handi-mag!



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> -Drew Daniels Applications Engineer Teac/Tascam Professional Products Group Montebello, Ca.

Deep Throat?

Given the throat area of a horn, how is the exponential flare determined? At what point is the mouth area considered? What texts or publications deal with horn design in great enough detail to answer these questions? None of the popular books delve into horn theory this far.

> -Stewart Percy Watertown, Mass.

The cross-sectional area of an exponential horn doubles for a specific increment of length along its axis. The length of this increment determines the flare rate of the horn: a 365 Hz high frequency horn will double its area every 2" down its axis; a 48 Hz bass horn will double its area every 15"-obviously the low frequency horn expands much more slowly than the high frequency horn. In terms of the exponential equation, the horn extends to infinity in both directions; "throat" and "mouth" are just arbitrary points chosen to suit the driving mechanism and the intended low frequency limit of the horn.

Horn theory is well covered in Acoustical Engineering by Harry Olson (D. Van Nostrand Co., Inc.), and in Acoustics by Leo Baranek (McGraw-Hill). Good information on directivity control will be found in "What's So Sacred About Exponential Horns?" by Don Keele (AES pre-print #1038) and "Blasphemy—The Manta Ray Horns" by Clifford Henricksen and Mark Ureda (AES pre-print #1288).

> -Bruce Howze President Community Light & Sound, Inc. Philadelphia, Pa.

[AES pre-prints are available to nonmembers for \$2.50 per copy (pre-paid) from the Audio Engineering Society, 60 E. 42nd St., New York, New York 10165. For additional information, you can call the AES at 212-661-8528.]



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CIRCLE 89 ON READER SERVICE CARD

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By Norman Eisenberg

DOLBY C IN NEW DECK



Both Dolby-B and Dolby-C are included in the new DT-35 cassette recorder from Mitsubishi. The deck also features three heads and two transport motors with IC logic control via feather-touch buttons which include record mute and pause in addition to the usual functions. The four-position tape selector includes a metal tape setting, and there also is a fine-tune bias control. Peak signals are shown on a 19-segment fluorescent meter. Wow-and-flutter is spec'd at 0.04 percent WRMS.

CIRCLE 11 ON READER SERVICE CARD

SUBMINIATURE MICROPHONE

The model AT831 from Audio-Technica is described as a subminiature electret condenser microphone with a unidirectional polar pattern. It was designed, says AT, for use in high-quality sound reinforcement systems and by professional musicians, especially for instrument pickup. AT explains that in handsfree applications the AT831 will provide improved gain before feedback that cannot be achieved with miniature omnidirectional microphones. The AT831 is 4.4 inches long and 0.83 inch in diameter. Close response is listed as 50 Hz to 18 kHz. Accessories furnished include a clothing clip, guitar adaptor, windscreen, battery and protective carrying case. Optionals include various cables and a line matching transformer.

CIRCLE 12 ON READER SERVICE CARD

COMPACT MIXERS

A new line of compact mixing consoles-the 83 series-has been announced by Biamp Systems of Beavertown, Oregon. Available in 6-, 8-, 12- and 16-channel versions, the new boards are upgraded replacements for Biamp's 82 series mixers which have been discontinued. Input channels feature trim control, three bands of EQ, effects/reverb send, monitor send and pan control. An LED peak indicator monitors channel overload. Each channel also has a patch jack which is post-EQ and pre-fader. The variable-gain input stage is transformerless and balanced. Output metering is handled by two 10-segment LED ladders. A total of three line-level inputs provide effects return access to both submasters and the main and monitor outputs. Reverb is pannable between main and monitor outputs.



CIRCLE 13 ON READER SERVICE CARD

PULSAR PRODUCTS

Pulsar Laboratories of Mogadore, Ohio has several products to offer. Its amplifiers (class "high AB" operation) are classified as rugged dependable operators and feature three professional models; A1500P, 125 watts RMS at 8 ohms, 0.5% THD (worst case); A2500P, 250 watts RMS at 8 ohms, .05% THD; A3500P, 350 watts at 8 ohms, .05% THD. All components are on removable module cards (except for the power supply), which allows for relatively easy replacement should a card fail during a performance on the road. Simply replace the faulty card with a spare. This, of course, is especially important for touring musicians because it means carrying spare cards rather than spare amplifiers. The amps are rack mountable; provide XLR-balanced input



connectors; are constructed of 16-gauge welded steel with 16-gauge steel internal bracing; and exhibit LEDS for clipping, DC protection, fan (studio adjustable) and thermal overload. Also from Pulsar Labs is the rack mountable RTA-150 real time analyzer. The unit contains, as the manufacturer says, four instruments in one: fifteen-band real-time 2/3 octave analyzer, sound level meter, wave analyzer and pink noise generator. The RTA-150, which can be used for everything from controlling feedback at "live" shows to calibrating tape decks, has frequency bands from 25 Hz to 16 kHz. The mic input is located on the front panel and is a balanced female XLR connector, while the AUX 1 and AUX 2 inputs are on the rear-balanced female XLRs and ¹/₄-inch phone jacks.

CIRCLE 14 ON READER SERVICE CARD

COMPRESSOR/LIMITER

From Symetrix of Seattle, Washington there's word of its new model 501 Peak-RMS Compressor/Limiter. The device is designed to function as both a fast-responding peak limiter, and an RMS compressor in one compact package. Broadband distortion is said to be less than 0.015 percent at any output level; noise, better than -88.5 dB. The device



has a "soft knee" threshold which permits the transfer from the linear operating region—into compression or limiting—with "virtually none of the objectionable threshold characteristics of conventional 'hard knee' limiters." Also incorporated in the 501 is a feed-forward side-chain. As opposed to traditional feedback techniques, feed-forward is said to permit compression ratios of up to infinity while maintaining freedom from distortion and modulation effects. Input and output are balanced and use XLR-type connectors in addition to ¼-inch phone jacks (for unbalanced operation if desired). Price is \$425.

CIRCLE 15 ON READER SERVICE CARD

VERSATILE CASSETTE SYSTEM

Unusual versatility for many applications is built into the Sharp RD-688AV "double cassette recorder." The unit has two cassette compartments, one for playback only and the other for record and playback. In addition the machine has a separate (track 4) sync control track with facilities for sync play, record, duplicate and "regenerate." A switch provides for dubbing from "tape 1" to "tape 2." The unit also can be set up to automatically play a second cassette (stereo or stereo plus sync) as soon as the first cassette has finished. Continuous play of both cassettes is possible, as well as simultaneous play of both cassettes (through separate sets of headphones if applicable), as well as fading between the two tapes or between one tape and an external sound source. The RD-688AV, says Sharp, is designed for traditional A/V applications such as multi-media production and presentation, and it also has uses in other "creative sound" applications for studios, broadcasting, theater groups, musicians, or home-recording enthusiasts.

CIRCLE 16 ON READER SERVICE CARD



LOW COST OUTBOARDS

Among the host of new audio products from Rotel are four low-cost outboard units for special applications. The RN-560 (\$250) is a Dolby B-C noise reduction system with indicators and separate level controls for record and play. The RE-500 is a stereo graphic equalizer offering seven control bands on each channel, covering the range on frequency centers from 40 Hz to 15 kHz. Price is \$150. More sophisticated is the RE-1010 (\$200) which is a stereo octave equalizer (10 bands per channel) using active inductorless circuitry. Finally, there is the RY-1010 spectrum analyzer (\$400) which provides 10-band LED display of the audio spectrum and which is supplied with generator and microphone.

CIRCLE 17 ON READER SERVICE CARD

SIX-CHANNEL P.A. AMP

From Randall Instruments Inc. of Santa Ana, Ca., comes word of its RPA-600, described as a quality sixchannel 120-watt RMS output P.A. amplifier with both low-Z and high-Z input capabilities. Both the master and monitor sections have five-band graphic equalizers. Each channel has an input attenuator and clip light which are said to virtually eliminate input overloading. In addition, each channel has a high-EQ and low-EQ control plus a reverb send control and a slider fader. Master and monitor sections also have an effects/auxiliary gain control and a master reverb control plus a slider fader. Built-in reverb is standard, but effects-in and out jacks are provided for use with separate effects modules (the internal reverb still can be used with these).



CIRCLE 18 ON READER SERVICE CARD

POWER AMP HAS "AUTO BUFFER"



The model MA5002A stereo power amp from Soundcraftsmen incorporates a new "auto-buffer" circuit designed to provide automatic instantaneous internal electronic compensation for intermittent or continuous 2-ohm operation, without actuating the protective circuitry and without current limiting. Also featured is a 20-LED metering system for each channel for power output displays into 4-ohm and 8-ohm loads. The range covered is from 0 to 1000 watts (+3 dB into a 4-ohm load). The 8-ohm power rating of the new amp (20 to 20,000 Hz at less than 0.09 percent THD) is 250 watts per channel. The 4-ohm rating is 375 watts per channel. TIM is listed as less than 0.02 percent; slew rate, greater than 50, IM, less than 0.05 percent; dynamic headroom, better than 2 dB. All specs are for continuous operation, FTC sine-wave power ratings, with no shut-down during tests. According to the manufacturer, the amplifier's class "H" circuitry uses low operating wattages for energy conservation, and allows use without a fan under all normal operating conditions. Of rackmount width, the amp has 1/4-inch phone jack inputs and 5-way binding post outputs. Price is \$849.

CIRCLE 19 ON READER SERVICE CARD

NEW MICROPHONE LINE

Philips has introduced a new series of microphones designed for music, P.A. and hi-fi applications. Included are: model 7100, cardioid dynamic for vocal and general purpose recording and P.A.; model 7200, a stereo cardioid dynamic mic for "one-point" stereo miking; model 7300, a professional cardioid dynamic for vocal and instrumental recording and sound reinforcement; model 8200, a lavalier condenser mic for broadcast and sound reinforcement (this mic requires a PX-675 battery).

CIRCLE 20 ON READER SERVICE CARD



NEW HEADPHONE LINE

Kenwood has entered the stereo headphone market with three ultra-lightweight dynamic models, supraaural types that are acoustically vented. Pressuremolded polyester diaphragms are about 1 inch in diameter. Headphones have snap-off foam ear cushions and easily adjustable headbands. The KH-7 (\$80) has rated response from 20 Hz to 23 kHz; maximum power input is 150 mW per channel; input Z is 32 ohms; sensitivity is 98 dB. Connecting cord is 9.8 feet long. Weight of the headset (less the cord) is 1.8 ounces.

The model KH-5 (\$50) has the same specs except for a top frequency of 22 kHz. The KH-3 (\$30) has a top response of 20 kHz; input Z is 24 ohms; sensitivity, 95 dB. Its cord is 6.5 feet long. Weight, less the cord, is 2.1 ounces.

CIRCLE 21 ON READER SERVICE CARD

PRODUCES SIX DELAYS SIMULTANEOUSLY



The Stereo Tapped Delay (STD-1) from A/DA Signal Processors of Berkeley, California can produce six different delays simultaneously which, says the manufacturer, makes it the most powerful time processor available for stereo flanging, doubling and multi-voice chorus effects. A voltage-controlled analog device, the STD-1 can vary delay time from 1.3 to 55.5 ms., and it is continuously variable over a 1 to 5X range. Sweep rate varies from 0.1 to 25 seconds for a complete cycle. A sweep modulation control superimposes a higher frequency sweep pattern over the regular sweep, allowing vibrato sweeps to random "sample and hold" sweeps. Fitting one rack-mount space, the STD-1 has an 8-step LED headroom indicator. Options include balanced line in/out; control pedal (V.C. footpedal); remote dual footswitch for effect and generation in/out; and a 240 VAC power supply. Price is \$800.

CIRCLE 22 ON READER SERVICE CARD

WHO'S AFRAID OF THE BIG BAD WOOF?

In a way, those big, way-down, heavy-decibel drum thumps in the Telarc recording of Tchaikowsky's "1812" Overture (Telarc DG-10041) symbolize much of what is good, and something of what is—shall we say, questionable—in the digital-to-analog process. The good news here is the very fact that such awesome sound can be cut onto a vinyl analog disc. Very impressive, and a real challenge to the playback pickup, arm, amplifier and loudspeakers. It is no secret, of course, that on many an otherwise perfectly nice turntable-pickup system, some of those recorded passages will kick the stylus right out of the groove.

What is open to question in this is whether the master tape has to be digital in order for a record to contain such sound. My guess is that it does not. I think a canny record cutter can do pretty much anything wanted when the cutting head is plowing through the master disc, and that the awesome sound of some analog discs cut from digital tapes is basically a matter of not holding back in the analog processing, rather than suddenly coming upon anything really new in the analog processing. By the most liberal estimates I have been able to get from persons in this field, the best signal-to-noise ratio of an analog master disc can be no higher than 65 dB. This is already some 25 dB lower than the theoretical maximum of the digital master tape, and by the time the master disc itself is processed down to the commercial releases we listen to, chances are another 5 or 10 dB have been lost.

To put it another way, a record could be cut from analog master tape that could contain passages that will cause mistracking when played with something less than a really top-quality pickup. In this sense, the awesome bass of some of the "digital" (actually, analog cut from digital tape) discs seems more like advance advertising for the truly digital disc yet to come. And this disc, of course, will create no problems for today's turntables and pickups because it cannot be played at all on them, requiring a whole new kind of playback equipment.

In other words, those big bad woofs in the socalled digital albums are less a matter of digital and more a matter of no-holds-barred analog cutting. They are not necessarily the exclusive attribute of digital, and if they disturb your present pickup momentarily do not worry over it—your present pickup was never designed to cope with such modulations.



ELECTRONIC ACCESSORIES

MXR Innovations has announced a new addition to its Professional Products Group of rack-mount signal processors. The new model is the MXR 151 Delay System II, an advanced digital delay line with expandable maximum delay capabilities. The standard version provides 400 milliseconds of delay with a full 16 kHz bandwidth which can be stretched to 800 ms at 8 kHz bandwidth or 1.6 seconds at 4 kHz bandwidth, and all these maximum delays may be doubled with the addition of an optional plug-in memory

Also new from MXR is the latest addition to its Musical Products Group, the MXR Micro Flanger. This new unit is a very compact, battery-powered flanging device with simplified, useroriented controls. The Rate control simultaneously varies both the rate of the flanging sweep and its width. decreasing the width as the rate increases to allow musically usable effects at any setting. A Regeneration control is also provided to vary the feedback or regeneration from 0% for the "classic" flanging sound up to 100% for very metallic, nasal effects, particularly at slow flanging speeds.



card, for 800 ms capability at full 16 kHz bandwidth or up to 3.2 seconds at reduced bandwidth. A four digit display on the front panel indicates the amount of delay actually being produced while an LED indicator shows which of the three bandwidth limits applies Controls on the unit include coarse and fine delay set knobs, speed and width controls for swept delay (for flanging, chorusing and Doppler shifting), dry/delay mix, regeneration and input level, and switches are provided for dry signal mute, delay signal phase inversion, repeat hold and delay bypass, the latter two with LED indicators. Input and output connectors are via either XLR type or 1/4-inch phone connectors: a switch allows level matching for line level or instrument inputs.

CIRCLE 4 ON READER SERVICE CARD

The MXR Micro Flanger uses special low-current circuitry for both very low noise levels and low power consumption for extended battery life; power consumption is said to be about 1/3 as much as competitive units.

CIRCLE 5 ON READER SERVICE CARD

The Boss division of RolandCorp US recently announced two new additions to its already extensive line of electronic sound modifiers and accessory products. The first of these is the GE-7 Graphic Equalizer, which is basically an updated version of the company's popular GE-6 model. The new model features several singleoctave bands of equalization, each with ± 15 dB of boost or cut plus an overall gain control also having a ± 15 dB range to allow any desired balance between direct and equalized level. Center



frequencies of the equalizer bands are on octave centers from 100 Hz to 6.4 kHz. The GE-7 is housed in the familiar Boss compact pedal package, and has all the standard Boss features including silent FET switching, LED on/off indicator, non-skid pads on the bottom and on the switch pad and single-screw, no-tools access to the battery compartment. The other new Boss product is the DM-2 Analog Delay Line. The DM-2 provides 20 to 300 milliseconds of delay and has built-in noise reduction circuitry to achieve the remarkable noise figure of -100 dBm



(IHF, A-weighted). Controls are provided on the unit for Repeat Rate (or delay time), Intensity (sets the number of repeats, from a single slap up to oscillation) and Echo Volume (sets the balance between the direct signal and the delayed, echo signal). The delay effect may of course be switched in and out using the silent FET switching and an LED in/out indicator is provided along with the other standard Boss features.

CIRCLE 6 ON READER SERVICE CARD

Electro-Harmonix has added two new products with its line of electronic sound modifiers. First of these is the E-H Graphic Fuzz, which is the new top-of-the-line overdrive/distortion unit in the company's line. Besides low-noise, low hum circuitry, and an LED status indicator, the Graphic Fuzz includes a six-band graphic equalizer for versatile and precise control of the tonal quality of the fuzz it produces; each band of the equalizer has a ± 15 dB control range for a wide range of tonal colors. Perhaps the most interesting aspect of the Graphic Fuzz



is its Dynamic Response Control, which is designed to retain the dynamics of the player's style while adding the rich harmonics of a fuzz-tone. The second new product from Electro-Harmonix is the new Digital Delay with Magna Storagetm. The unit has two switch-selectable delay ranges, 8 ms to 1/2 second with 12 kHz bandwidth, or 1/2 sec to 2 sec with 3.5 kHz bandwidth. Noise reduction circuitry is included within the unit to yield a signal-to-noise ratio of 85 dB. The Magna Storage feature allows the user to record up to 2 seconds of material and keep it continuously playing back until the Magna Storage button is depressed a second time. Both Magna Storage and the main in/out for the ef-

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fect are accomplished via silent electronic switching, and both footswitches have LED indicators. Slider type controls are provided on the unit's panel for chorus speed and depth, echo repeat and delay and output level.

CIRCLE 7 ON READER SERVICE CARD

PERCUSSION ITEMS

Dean Markley Strings, Inc. is best known for its guitar and bass strings, but the company has now branched out into drum accessories with the introduction of Stix premium drumticks. A government study of hardwoods and their ability to withstand impact pressure was the impetus for Dean Markley to design a better drumstick. This report revealed that of the various types of hickory wood (the wood traditionally used for drumsticks) four types will withstand much more impact pressure than the more popular grades, and Dean Markley's Stix are manufactured from one of these premium grades of northeastern hickory. Kiln-dried hickory is used in manufacturing Stix to virtually eliminate warpage, and the turned Stix are soaked under pressure in a special blend of furniture oils to add resilience and impact resistance, and to reduce splitting and cracking. From the oil, the Stix are hand-wiped, inspected for straightness, hand buffed on a felt wheel, graded and matched in pairs for color, weight and balance, inspected once again and packaged.

CIRCLE 8 ON READER SERVICE CARD

Avedis Zildjian, the American makers of Turkish cymbals, has announced two additions to its extensive line of cymbals. First is the new Deep Ride cymbal, which features a deep, dark, funky sound compared to typical ride cymbals. The Deep Ride uses a special, gentle cup shape and an extremely flat taper along with its medium-heavy weight to allow drummers to play intensely without the usual build-up and loss of "ping" quality. Zildjian Deep Ride cymbals are available in 20" and 22" diameters. Also new from Zildjian is the Quick Beat hi-hat, which offers drummers an alternative to the very popular New Beat hi-hat. The Quick Beat is similar in weight and overall tone to the New Beat, but the bottom cymbal is flat, having four holes instead of a cup for a





more controlled sound. The Quick Beat hi-hat is said to have a short, compact sound with fewer overtones, and is particularly suited to many rock and disco drumming styles.

CIRCLE 9 ON READER SERVICE CARD

From Griffin Research and Design comes news of the Pressure Cooker, a new electronic concept in practice drum kits. The Pressure Cooker looks very much like a set of practice drums with a kick drum, snare drum and two toms, but unlike a conventional practice kit these drums connect to a control unit where the sound of real drums is generated for the drummer to hear over a pair of headphones, giving him a real-sounding practice kit that won't disturb the neighbors. The sounds produced by the Pressure Cooker are not synthesized drum sounds, but real drum sounds digitized and stored in solid-state memory. The Pressure Cooker has inputs for a tape recorder or other source of music so that the drummer can play along, a line output to feed to a tape recorder or amplification set-up and dual headphone outputs so that someone else can listen in. Full playing dynamics are preserved by the Pressure Cooker system's electronics. And for the truly discriminating user, there is the Custom Pressure Cooker, which is the same as the regular model except that the sounds are custom programmed from a tape furnished by the customer.

CIRCLE 10 ON READER SERVICE CARD

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By James F. Rupert

I f you are an individual with a photographic memory, there is no need for you to read the following article. However, if your memory for details is anything like it is for the rest of us (I can't remember what color an orange is!), you'll have to join in with the select group of ninety-nine and fortyfour one-hundredths of humanity that is forced to commit to paper the information it wishes to preserve.

As the title implies, (see it up there?) keeping records in a studio can end up killing a lot of trees for the paper you will end up consuming. And I'm not even including financial records in that statement. Records of your work in the actual recording process should be knocking off just as many oaks and maples as invoices, bookkeeping and accounts receivable.

For the convenience of your customers and the sake of your own nervous system it can really pay to develop some kind of plan for preserving the in-session information that you take for granted during the session itself. That same information is not so crystal clear a year later when the customer wants a re-mix of his master or wants to add a few more tracks. You might find yourself wishing you had written down a few more things twelve months earlier.

To make things clearer, let's go through a hypothetical recording session with a hypothetical rock group at our hypothetical studio. The group has backed its truck up to your door and is about to load its equipment into your beautiful, 50,000 cubic foot, acoustically controllable, temperature and humidity regulated, not-an-egg-cartonon-any-wall studio facility. (I said this was all hypothetical, didn't I?) The group has given you the cash deposit you have told it is mandatory before it can start and it is preparing to begin throwing its gear inside. Right after you tenderly finger your lower abdomen and tell them the sad story of your hernia and your inability to lift anything heavier than a twelve pack, you should be preparing to fill out the first of a series of forms throughout the session.

While the group members are unloading their equipment, your insurance company will love you if you start making out an inventory list of what they are bringing in. (See Fig. 1.) This list tells what they are bringing in and has two boxes by each item for checkmarks. One box is for when they come in and one is for when they remove it at the end of their appointment. A group representative will then sign the list after the equipment is unloaded to verify that it is accurate, and after the gear is reloaded in the truck to state they have received everything that is theirs back. Tell them you will provide them with cords and direct boxes (and see to it that you can) so they will not have to check off dozens of little nickel-and-dime items. This way nobody can call back in two months demanding a cymbal or effects box that they are just sure they left there when they were in to record. You don't want to rip anybody off, but at the same time you don't want the green weenee stuck to you either. This list makes it the group's responsibility to pick up and remove its own personal property. It also could save you a few dollars if a piece of your studio equipment somehow should turn up in the

band's stuff during the check-out process. You have proof that the piece in question was definitely not brought in with them. This doesn't prove it's yours, but it is most assuredly not theirs. Even if you're recording a busload of nuns, go ahead and fill out that inventory sheet if they are bringing in equipment. Also, be sure and give the customer a photo copy or carbon-copy when the session is over. It's for everybody's protection.

Now we'll skip ahead to when you've got them corralled in the studio and have pointed out where you want each player in the room to set up. You've set up your mics and direct boxes and answered all the preliminary questions. While the group finishes setting up and tuning, you return to the control room to plan out your channel assigns and general signal routing. Now is the time to make like Matt Dillon and whip out a track sheet faster than greased lightning. A track sheet (see Fig. 2) is the backbone of all the records you will take during this session. With this form you will have instant future reference to every decision made during the recording of each song the group lays down.

The example in *Fig.* 2 is a typical track sheet for a small 8-track studio. By the time the song is finished and mixed down to stereo there will probably be two of these forms filled out for each song. The first will be for information during the initial recording, the second for mixdown. On the recording sheet, the original EQ used will be of more interest than the volume settings, but during mixdown the volume settings for each channel are of considerable importance. On the original

multi-track session, note the particular instrument used on each channel in the respective box for that channel. If tracks end up being bounced you can split each box in half and list the new bounced track designation in the lower half of the box.

It would probably be a very good idea if you also were to list the microphone used for each track. If the track was taken direct or, in the case of drums, with multiple mic set-ups, state so on the sheet. (You can always jot down the multi-mic arrangements on the notes section of the sheet.) If you've used an outboard equalizer, also note that, and which track(s) it was used on. Don't forget to list its settings on the sheet.

The track sheet allows you to get all the information you will need in case the multi-track mother tape ever has to be worked on again. I've even included spaces for the reverb and digital delay settings and channel assigns. If the original recording was done dry, you can note it right on the sheet. Depending how much of a purist you are you might be doing your multi-track work dry and with totally flat EQ. (Too purist for this kid!) However you are laying down the sound, the important things is to preserve the information of how you handled it for you or anybody else who might have to rework the tapes at a later date.

The form also has spaces for a lot of convenience information. You can list the final time for the cut, what kind, if any, noise reduction was used, tape speed, tape counter setting and who worked behind the board. If you are doing work for an advertising agency or professional organization, you can list their purchase order number under the client's name on the "Client" space provided, making invoicing them upon project completion just that much easier. As nit-pickey as some of the poop on the sheet sounds, it's data you need to know now and will need to know down the pike. It not only can save you a lot of time, it can keep you from looking pretty stupid to that same client later. When the recording date's over you can pop it right in the box with the tape so it's there when you need it again. Nothing to it, see?

While the actual recording is going on, there probably are going to be a few mistakes and bad takes by the group. You can list these on what is called a "take sheet." (See *Fig. 3.*) The take sheet lets you know what is on the entire multi-track mother tape. In addition to the counter settings you can mark down the number of slate tones you laid down to show which number take it was for that particular song. You then know how many slate tones to listen for in high speed searches to find the final "keeper." If you have no slate tone pulser, you'll just have to listen and count. (It's a bite, but you'll be a better person for it, believe me.)

After you have determined the final take, you also can then list the final counter reading for the keeper on the track sheet. At the top of the take sheet you'll see spaces to note both the track sheet it corresponds to and the master reel number. You should start your own numbering system for your reels and put the same number for the reel on the track sheet and take sheet. That way, everybody will know what goes with what. If the song requires editing from multiple master reels, you can list the track sheet number and still squeeze in other reel numbers under the "Master reel" space. Shoot your take sheets in the master reel box with the track sheets at the end of the day.

Either on the back of a track or take sheet or on a separate form you can

ARTIST/CLIENT SIGNED IN BY DATE SIGNED OUT BY					
INVENTORY LIST					
ITEM	MAKE	MODEL	IN	OUT	
Amp	Float- a- Tone	"Gagooda Ripper #2"	V	V	
Guitar	Wombat Ltd.	"Gagooja Ripper #2" "Wombat Wacker 2000"	V	V	
				_	
_					
			-		
			_		
				_	



"Tape or get off the pot!" (Our Motto)	1	Client Producer Engineer Artist Date		
Final Time Dolby DBX Burwen				
Selection		Speed	Reel No.	Tape Count
Volui	ne/EQ Setti	ngs		
1				
2				
3				
4				
Reverb Settings	NOTES	Settings		



design, you should be keeping a record of the work done for the client. It's a good idea to list separately the time and charge for the different phases of production such as studio time, editing, production/assembly and mixdown. Ad agencies, especially, will want to know how much time was spent on each phase in order to return appropriate charges to their customers. A sheet of lined notebook paper will work fine for this. so dig out all those "Big Chief" tablets you haven't used since you drew horsies on them in grade school. Include all this information on the final invoice when billing the client.

Once the project is finished and reels

have been numbered, you're going to have to store them in a safe place where you can put your hands on them in a hurry if need be. This is where that reel numbering system comes in. You might start with alphabetical headings followed by numbers for each reel. For example, the Altoona Sprocket Company tapes could be filed and listed under A-1, A-2 and so on, Bulldingy Manufacturing under B-1, B-2 and down the line. The same number is written on the end of the reel box, on the track sheet and on the take sheet. Smart folks would then start an alphabetical index for the reels in a separate notebook or on 3" x 5" file cards. After that it's just a matter of being able to file alphabetically and you'll never have to frantically search for lost matters again. This system can be implemented for both 1/2" and 1" multitrack masters and 1/4" mixed masters.

A reel filing system can be a lifesaver. We once had a group called "Fateful Lightning" wait 45 minutes while we were searching for its tapes, which turned out to be mistakenly stuck in among the masters for the Roth Chemical Company. Imagine my embarrassment when I had to tell my assistant to go "loose" the 'Fateful

Artist/C Enginee	lient	Track Sheet # Master Reel # Tape Speed Date
Take# Counter	Title	Remarks
1 000	"Love Is A Monkey Buster"	Bass out of Tune
-	11 11 11	Drummer went to restroom
3 101	11 11 11	Singer Forgot Words
2 081 3 101 4 121 5 163	11 11 11	Singer went to restroom
5 163	11 11 11	Broken String
6 188	11 11 11	Drummer Needed Restraam Again
7 235	11 11 11	Keyboard Lost RHYTHM
7 235 8 293 9 3/0	11 11 11	Engineer Needed Restroom
9 310	11 11 11	Singer Sneezed
10 351		Restrant Flooded - Sussian PostPawad !!

Figure 3

Lightning' where the tapes of Roth were stored." (OW! That one hurt even on this end!)

These forms are only intended to be a starting off—not a jumping off point. Your own situations and methods may call for additions and refinements of your own invention. This is not only fine, it is recommended. Anything that works for you is the right way. If you're lucky enough to also own a personal computer with graphics display, you have a potentially superior record keeping system right at your fingertips. (No pun intended.) How you preserve the information is not as important as just keeping it in the first place.

I hope this article has helped impress the importance of proper record keeping upon the brains of those of you who do not have photographic memories. Those of you who do have photographic memories and have read this far can probably recite the last few pages word for word and toss in the first six lines of "Gunga Din" as an encore. As for me I seem to have forgotten how to end this article, so I will leave you now. I sure wish I could remember what the name of the game is that you use this basketball in...



That's what Modern Recording said about the EX-18 stereo 2-way/moro 3-way electronic crossover. The same statement could very well apply to the new TAPCO 2210 and 2230 graphic equalizers as well.

The EX-18 provides all the necessary controls and functions for bi-amplifying stereo or tri-amplifying monaural speaker systems, and this can be accomplished

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using a unique mode switch so no external patching is required. A single knob on each channel adjusts the crossover frequencies, with a 10X multiplier available for very high frequency crossover operation. It is definitely one of the cleanest and quietest electronic crossovers available.

The same precision design and human eng neering found in the EX-18 s found in the one-third octave 2230 and the dual ten-banc 221C graphic equalizers. Both are magnificent performers in recording and sound reinforcement applications. Whether you need the precision of the 2230 with its corrbining filter action, sw tchable high and low-pass filters and floating balanced outcuts, or the economy and flexibility of the 2210, there are simply no better values n today's marketolace

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n Japan: otsuya. Tokyo, Japan 130



What the world doesn't need is another 24-track recording studio. However, entrepreneurs are searching out acoustical geniuses, interior decorators, equipment suppliers, etc., and putting together more and more recording studios. Just what are the motivations for such folly in the face of scores of studios going out of business or being sold?

Hopefully the new studio owner is that rare breed of person who intends to spend his whole life in this business. If this is his motivation then he will probably go about it in a sensible fashion and build an institution that will further the cause of all recording studios and the industry in general. But, there are many other motivations that cause people to go into this business. To varying degrees the motivations are all valid; but when the priorities get mixed up the results are less than perfect. The first motivation, hopefully, is to make great records. If one's goal is to turn out a superior product, everything else being equal, the end result will probably be a studio the industry will be proud of, and one that will ultimately be successful.

Let's talk about what should make a studio successful.

Success means different things to different people. Success can be measured artistically; it can be measured financially; it can be measured relative to one's ego. These are the success orientated motivations that cause studios to continually pop up. Then why aren't more studios successful? The reason is simple: The ingredients of success are not in balance. Just having the motivation is not enough. The artistic, the business, the ego must all be orchestrated in such a way as to work together. Also, all the ingredients must be present. A studio built just for artistic purposes with no sense of business or ego drive is in reality a sound laboratory. A studio built just to make money does damage to the entire industry. A studio run only as an ego gratification will only be perceived as a studio by the egomaniac running it.

Let's not talk about the artistic motivations other than to quote Aristotle. He said for anything to be considered art it must appeal on four levels of human perception. ONE: It must appeal to our carnal instincts, our animal drives. It must reach our very core of life. TWO: It must have an emotional quality. We must love it. hate it. fear it. THREE: It must have an intellectual quality. We can analyze the substance and get gratification from its form. FOUR: It must have a spiritual quality that either elevates us or lowers us depending on the nature of the spirit.

To put Aristotle in everyday studio language, **ONE**: I feel that bass drum right in my chest. **TWO**: That rhythm section really turns me on. **THREE**: I find it very interesting the way they mixed the guitar relative to the Fender Rhodes on the background passages. **FOUR**: That record makes me glad I'm alive.

Perhaps it's the artistic motivation

that really separates the men from the boys.

Money. In the sixties and seventies when there were more artists than the studios could handle, studios made lots of money. This writer personally knows of two studio owners during this time that cashed out to be millionaires. However, in the late seventies and early eighties everything changed. There were more studios and fewer artists, and, to make it worse, each artist had less money to spend on more expensive goods. The result was that the studio business was no longer that once highly profitable business.

Well, just how profitable or unprofitable is the studio business? Here is a simple example:

John Doe is a recording mixer. He has a small following of non-superstar acts. He decides to open a recording studio. He feels his studio will be superior to all the others he has worked in and he will be able to keep all the money for himself. John has it totally under control. His wife Jane will act as receptionist, bookkeeper and his father, who has a lot of electronic experience learned in the Navy during the Korean conflict, will be his chief tech. Currently John is earning \$30,000 a year as a mixer, his wife is earning \$18,000 as an office manager for a computer company and his father is earning \$24,000 a year as a dispatcher with the local bus company. This new studio will have to pay its three employees a total of \$72,000 a year plus about another \$10,000 in
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miscellaneous payroll taxes to the government (city, state and federal) in order to maintain their present income levels. The major medical, dental and life insurance plans might run about \$1,000-1,500 in addition for the three of them. Oh yes, there will be a company car, and a company van that Dad can use for himself. This will cost approximately \$5,000 a year. So the entire employment package necessary to equal what everybody was making on the outside would come to about \$88,000 a year—plus gasoline.

The studio will cost about \$300,000 including construction and equipment. The construction runs about \$80,000 and will be financed by taking a second mortgage on Dad's home. John was lucky and was able to obtain a mortgage at $16\frac{1}{2}$ %. This will cost the company about \$13,000 a year in interest. Everything else is leased. Of course, being a new business, both John, Jane and Dad have to guarantee the lease. The yearly cost on the lease might be around \$58,000 a year. This brings the total yearly nut to \$159,000 before any money comes in.

There will be some other expenses. John's rent should be around \$12,000 a year plus utilities and increases due to real estate taxes. These figures vary across the country, so let's for the sake of discussion round out rent and utilities to \$20,000 a year. The phone will be \$4,000 a year. Various kinds of insurances...\$5,000 a year. Then there are all those supplies. Boxes, labels, log sheets, invoices, stationery, envelopes, pencils, coffee, typewriter ribbons, white-out, ashtrays, matches, withholding slips, shipping cartons, felt-tip pens, splicing tape, extra reels, razor blades, grease pencils, toilet paper, towels, cleaning materials, plus more that has to cost a minimum of \$10,000 a year. Now the nut is at \$198,000 a year. Let's add another \$33,000 on general principals and the final cost of operation is \$231,000 a year. Good luck. It will be higher.

Assuming John, Jane and Dad are good managers, engineers and janitors and they indeed can bring the operations in on budget, how much must they charge to break even? Since John is the only engineer and Dad can only be an assistant when he is not fixing or cleaning up, probably forty hours a week could be a good average to put in without sapping John's creative juices. It might be twelve hours on one day and four on the next, but an average of 40 hours. Taking vacations and holidays into consideration there are about 2,000 hours John will be able to book in a year. In order to break even John Doe has to charge \$115 an hour. Of course he will make profit on his tape sales. At this volume it might be \$12,000 a year which in effect would help to off-set the start up cost when no income came in.

Assume the start up cost was \$100,000. John borrowed this amount from Dad who withdrew it from his money market fund. (Those bus dispatchers are thriftier than one thinks.) Dad's lost interest is \$15,000 a year. John replaces this by booking an extra 2.6 hours a week. But Dad is stubborn. He thinks John should start a sinking fund, so in five years he can have his \$100,000 back. John books another 3.5 hours a week. His work week is now 46.1 hours long. Poor John used to get overtime when he put in over forty hours. Well, eventually John has to get an attorney and an accountant, and to make matters worse, once in a while John and Jane have to entertain a new client. Fifty hours a week is not too much to put into your own business, if only you didn't have to put in those extra 10 hours to replace the money lost through bad debt and slow payers.

Jane asks John why he doesn't increase his price from \$115 an hour to \$125 an hour. John replies, "How can I, our competitors down the street who have a \$400,000 studio and a resident gourmet chef only charge \$90 an hour including the tip."

Dad speaks up, "Diversify, expand." Well, Dad is wrong and so is John. And so is Jane for marrying into this family.

If John could get a "class" act that might pay more, his cost would go up. If a smaller act got a hit, they would probably build their own studio for "tax purposes" and never use John again. Remember that to break even John must book 60 hours every week, 50 weeks a year. So where did John, Jane and Dad go wrong?

They did not understand their power base.

Rule #1: ONE SHOULD NEVER

OPEN a RECORDING STUDIO UN-LESS HE CONTROLS ENOUGH BUSINESS to CAUSE the INFLOW of REAL CASH to EXCEED the OUTFLOW of REAL CASH by at LEAST 40%.

The definition of real cash in is the actual money one receives and is able in turn to spend. The definition of real cash out is all money spent, including interest, bad debts, reserves, depreciation at replacement value and most important of all, the cost of moneythose monies you lose by borrowing, not taking discounts or simply by not having the availability of funds for short term investment. The reason for the 40% figure is also quite basic. This whole business is very risky. In a risky business one's possible downside losses must be protected by an upside gain. Inflation will eat at least 15% out of that 40%, leaving only 25%. If you have doubts that you can't make a real 25% before taxes you should not enter the arena. You will need this much to overcome the obsolescence factor and still show real profit.

In John's case, he eventually needed \$345,000 to break even. To make 40% profit, he would have to do \$483,000 a year. His federal taxes on this would be about \$46,000, leaving a profit in his bank account of about \$92,000. Not bad. but let's look at reality. To obtain this figure John would have to work 60 hours a week at \$161 an hour. Remember John only has \$220,000 in equipment. Most top studios have this much cash tied up only in their console, automation and a couple of 24-track recorders. These same studios have to occasionally fight to get \$161 an hour, so where does this leave John?

It leaves John selling his studio not for \$161 an hour, not even for \$115 an hour, but more likely for under \$100 an hour. History shows that for every 10% decrease in price one must increase his sales by 22% to make the same money. So John must now work 72 hours a week or more.

There is no money or time for maintenance and repair. Everyone is too tired to think about it. Panic sets in. Dad already has a part time job to replace some of the cash the studio is not coming up with. John turns to the most used weapon of frustrated studio owners: He puts down progress. John is heard telling his clients that his \$220,000 in equipment is all anybody

Murray R. Allen is president of the Universal Recording Corporation in Chicago, a member and guiding light of the professional recording organization SPARS and a most respected member of the recording community.

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needs. "Those new super consoles, those new floppy disc automation systems, those new digital reverberation units, those new quieter microphones, those new improved analog or digital tape machines, that new test gear that really shows you what you're getting, those new monitors and monitor amps-none of this is important because nobody can hear the difference."

Poor John also is no longer a member of the community, which brings us to:

Rule #2: CONTRIBUTE in an ORDERLY andPOSITIVE FASHION to the PROGRESS and GROWTH of ONE'S INDUSTRY. DO NOTHING to DISTRACT from ITS GROWTH.

By impeding the progress and growth of an industry one impedes progress and the growth of all the members of the industry including himself.

Historically, well-meaning people have held back progress for mistakenly narrow commercial reasons. The church ex-communicated anyone who said the earth revolved around the sun. Pasteur was not taken seriously by his peers. Congress will not give NASA funds to bring samples of Haley's comet back to earth for study, but this same congress will waste twice the amount necessary to do this job on bureaucratic regulation and patronage.

All this brings us to:

Rule #3: TO FULLY REAP the AWARDS an INDUSTRY HAS to OFFER, ONE MUST GIVE TOTAL-LY of HIMSELF and HIS BUSINESS. IF the INDUSTRY CAN be MADE HEALTHY ALL WILL PROSPER. IF THIS INDUSTRY DE-VELOPS a CANCER ALL WILL PERISH.

■he John, Jane and Dad story is a compilation of many case histories. Take your own case and substitute your own numbers. Ask yourself these questions: Is your return on investment out-stripping inflation? Is your life style improving as to real purchasing power? Are you really turning out better records? Are you being honest with yourself about your studio's posture relative to healing a sick industry, or have you secretly given up and started hoarding your spoils before the collapse?

Speaking as one who has been in this business for over 30 years, I do not want to see the recording business go the way of the U.S. automotive and steel businesses. It's too new a business to develop a status quo attitude as we see in other American businesses. Fill the pipeline with under-capitalized studios charging 1970 rates for 1981 service and you will eventually have only a few studios left in business serving an ailing industry with nobody making any records or monev.

Perhaps we should return to this article's opening statement. What the world does need is more 24-track studios, 32-track studios, 48-track studios that are devoted to our business as an industry and will be willing to put more in than they will eventually take out-be it carnal, emotional, intellectual or spiritual. By following this recipe, it's nearly guaranteed the money will follow.



The A/DA Stereo Tapped Delay (STD-1) is the only voltage controlled analog delay capable of producing six different delays simultaneously, making it the most powerful time processor available for "stereo" flanging, doubling, and multi-voice chorus effects.

Conventional delays take one input signal and produce one output signal at one delay length. When a signal enters the STD-1, it is delayed, then tapped at six different non-harmonically related points ranging from 1.3 to 55.5 ms. This produces six variations of the signal, each capable of being assigned and mixed into two output channels. The non-harmonically related taps create a natural sounding time delay while other units at best are multiples of some fixed delay time, creating predictable sounding effects.

The extensive delay section produces a 1-5x continuously variable delay range from each tap. The delay time can be swept at rates varying from .1 to 25 seconds. As the Sweep rate is increased, the Sweep range automatically tapers so you perceive a change in rate only, without an accompanying change in

range as is common with other units. (You're not forced to compensate by backing off the C.V. Mix when you increase the Sweep speed). Further, the Sweep Modulation control superimposes a higher frequency sweep pattern over the regular sweep. This allows effects like a vibrato sweep to sweeps which appear to move randomly like sample and hold on synthesizers.

The regeneration section has been carefully tailored to achieve mechanical to natural sounding ambiences by providing separate Level, High Cut equalization, and Tap select controls that can be switched in or out from the front panel or remotely via the rear panel jack. The Level control determines the decay time at long delays (up to 15 seconds), and the amount of resonance at short delays (up to dB). Since a reverbant signal primarily consists of bass and lower midrange frequencies, the High Cut feature in the STD-1 reduces the high-frequency content in the program material as it recirculates through the system a more natural sounding echo. At longer delay

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times, echoes can be textured from a hard reverb to a soft spacious drone. At short delay times, the resonance can be shaped from a sharp "metallic ringing" sound to "boomy" bass peaking.

All these features working independently and in conjunction, allow such effects as high flanging, low flanging, voice doubling, multi-voice chorusing, echo, reverberation, machine gun reverb, singular to multiple 'doppler' effects, vibrato, and highly resonant flanging. Never before has such an unlimited number of delay combinations been available to the musician. engineer, or concert sound technician



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a session with

1978: Criteria Studio's Mack Emerman and producer Tom Dowd have a vision.

A million dollar, nine-sided one.

Emerman and Dowd head west from Miami to California to build Criteria West: a 28-ft. high, totally transformerless, nonagon recording studio. They buy the home of Woody Woodpecker (the Walter Lantz building) and begin extensive renovations.

First the roof comes off.

Then the bottom falls out. "All of a sudden everything just started going wrong," recalls Emerman today. "The interest rates went sky high, while our business here at Criteria fell off over 50 percent. The entire record business was just one big mess wherever you looked. Then the financing for Criteria West began falling through and Tom began having second thoughts about the entire operatior. I contacted the Bee Gees and at first they were interested, but then they decided to go ahead with their original plans to build their own studio here in Miami. After awhile it became obvious that Criteria West was a lost cause and I simply had to abandon the project. No, I take that back. Project isn't the right word. That studio was a twenty-seven-year-old dream for me.'



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And in the end, what the hell's a few interest points when you're talking dreams?

"Although I gave up on California, I never gave up on the idea of having that nine-sided recording studio," says Emerman. "And the more I thought about it, the more I just knew that somehow I was going to build it. Criteria has always stood for the best in this business; for the state-of-the-art and top-of-the-line. And to me that studio was the natural progression for a place that's prided itself on being the best. So I finally thought, what the hell, I'll just build it myself right here at Criteria."

Eighteen months ago Emerman broke ground on Criteria's fifth studio, a.k.a. Studio E. One million dollars and "every kind of problem" later, Studio E is now in operation. "A lot of people thought I was crazy to go ahead with the studio," says Emerman. "A lot of people still think I'm crazy. They feel the business hasn't recovered enough for me to be investing in something like this. But let me tell you. The first day I saw Studio E complete I knew there was no price tag on dreams."

There may not be a price tag on dreams, but there's certainly a rental fee. Eight hours of Studio E time clocks in at approximately \$1400. Oh sure, you get the teak, the pool table, the waterfall, the Sony KP-5000 big screen TV. But what's at the heart of this matter is a 48-track MCI 548 transformerless console; tri-axial custom designed monitors by Ed Long Associates; an EMI/MCI JH220 twotrack digital recorder; individual cue system controls; a microphone routing system direct to the faders; "live" echo chambers; a computer cutting room identical in shape and sound to the studio; and of course, the very sound benefits of recording in a room enclosed by non-parallel walls.

"The room is a modified LEDE (Live and Dead End)," says Emerman. "The room has no reflections and no colorations. There's no hype. And all of that results in a much more honest, a much truer reproduction of sound. The bass frequencies are also much truer in the control room. The room adds less distortion to the sound."

In other words: What you hear in Studio E is what you get.

Eagle Don Felder was the first to use Studio E for his contribution to the *Heavy Metal* soundtrack; while John Cougar/The Zone are the first band to record an entire album here. The controversial and affable Bloomington, Indiana singer/songwriter and the stateof-the-art Studio E are indeed a very strange marriage. Cougar on recording: "To me making a record means getting a bunch of guys with Fenders and Gibsons and Marshalls and just turning them up real loud." John Cougar/The Zone (guitarists Larry Crane and Mike Wanchic; keyboardist Eric "Doc" Rosser; bassist Robert "Ferd" Franks; and drummer Kenny Aronoff) are here at Studio E to record their highly anticipated new LP tentatively titled *American Fool.* Tracks slated for inclusion are: "American Fool," "Hand To Hold Onto," "Latest Game," "Valley of the Thundering Hearts," "Come Now Lady," "Jack and Diane," "Over Your Shoulder," "Weakest Moments," "Cat's In The Kitchen" and a remake of Garland Jeffreys' "Livin' For Me."

Cougar (nee Mellencamp) is producing the disc with a lot of help from friends (Criteria alumni) Don Gehman and (former Grand Funk Railroad assistant engineer) Mark Stebbits. Criteria engineer Dennis Hetzendorfer is also assisting with the project. Mick Ronson, Waddy Wachtel and Albhy Galuten have all stopped by with comments and suggestions with Ronson even adding some blitzkrieg guitar to "American Fool."

At 29, the boyish looking Cougar now finds himself in a most enviable musical position. After three LPs (most notably last year's fine Nothin' Matters and What If It Did), Cougar is poised on the verge of a major breakthrough from cult status to stardom. He understands his new-found place on the ledge very well.

"I know a lot of people are waiting



for this record," he says. "I understand that fully. The people in radio, the press, the fans. I know there's a lot of expectation out there and, of course, that puts a lot more pressure on what we're doing in here."

"There's now this sense of obligation that wasn't really there before with the other three albums (*Chestnut Street Incident*, produced by Tony Defries for MCA; *John Cougar* and *Nothin' Matters...* on Riva/Polygram). You want everything to be just right because you can feel the spotlight beI usually wound up giving in to their ideas.

"In the past, I could always blame the producer if I didn't like the way a record sounded when it was released. 'Hey, it wasn't my idea to use strings there.' You know, stuff like that. This time out, though, there's none of that. If you talk to me a year from now, regardless of whether this record is a success or a failure, you won't be hearing any of those excuses from me. This time around I'll only have myself to praise or blame."



ing directed towards you. It really makes you analyze everything a lot more carefully. And to be perfectly honest with you, I'm not really into that. I just like to get up there and sing from the heart. If it's off-key but it feels good, screw it, just leave it alone."

Alas, things weren't feeling too good at the start. After five weeks in Studio E Cougar scrapped all his songs and arrangements and started over. "I just wasn't happy with the stuff I had and I just wasn't going to be part of something I wasn't happy with ever again. That's happened to me too many times before. I don't really care for any of my other albums and now this is my shot, and I don't wanna blow it. In the past I've worked with other producers, and in one way or the other One isn't quite sure this is what Mark Emerman had in mind when he built Studio E.

"Basically what we've done here is just turn the whole studio into one big drum booth," says Stebbits. "Really, I wish we could sit here and talk about all these revolutionary ideas we're using to make this album, but we're not. The one big thing we are going after, though, on this record, is the drum sound. Hopefully it's going to be just unbelievable when we're through. Other than the drum sound, though, it's recording business as usual."

"What we're trying for here is an ambient drum sound," says Gehman. "With the high ceiling in here it's ideal for that kind of thing, getting that really splashy sound. What we're hoping to do is create an illusion with the drums. We want them to sound like cannons."

To this purpose fifteen Schoepps transformerless microphones surround Aronoff's Slingerland wood drum kit. The kit contains a 6½" snare custom built by Paul Jameson; five doubleheaded tom-toms (8"x12", 9"x13", 10"x14", 14"x14" and 16"x14"); a 14"x22" bass drum and seven Avedis Zildjian cymbals (two 18" crash, 17" crash, 16" crash, 22" swish with a 16" "garbage cymbal," 20" medium ride and a 15" Quick-Beat hi-hat.

A Linn Electronics, Inc. LM-1 Drum Machine will replace Aronoff on some of the tracks. "It's just to give the record a totally different sound," says Stebbits. "We're experimenting with everything we can to get a different drum sound."

Aronoff has been with The Zone for only 16 months. Before beginning recording, both he and the band rehearsed with a click (metronome). "The way we're trying to get the drum sound the click really helped us," says Aronoff. "There's not as much pulling against my time as there would have been. Of course, I feel the pressure with so much emphasis being put on my drum sound. But then again, I think I'd feel the pressure anyway. This is the first time I've ever been in a band that was so close to really making it."

"When I first started out in music the big thing was just to make a record," says Cougar. "Man, to make a record, now that was just everything to me. I never even used to think about how the damn thing sounded. Just the fact that there I was in a recording studio and making something I could take home and play was just unbelievable to me.

"But what happens is, as you go along, you find that making the record isn't everything. You learn that the record also has to sound real good, too. And it's funny, because it's only recently that I've started to think about how records sound on the radio and all of that. Before, hell, I'd even throw in a few 'f---s' or whatever just to make sure I didn't get played on the radio. But lately, with the music business being the way it is, you either get played on the radio or you just cease to exist. It's that simple.

"Which doesn't mean that I'm here to compromise my ass. It just means that you become aware of the

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INSTRUMENTS & AMPS

Guitars:

1957 Fender Stratocaster (Telecaster neck) 1964 Stratocaster 1969 Fender Jazz Master 1980 Fender Lead One 1960 Gibson 335 Coral electric sitar 1972 Gibson Les Paul 1970 Gibson Les Paul Deluxe 1969 Gibson Les Paul Standard 1960 Gibson SG 1979 Dean Custom 1979 Ovation electric 12-string 1970 Gibson Heritage 12-string 1969 Guild F-50 acoustic 6-string Harmony electric (year unknown)

Amplifiers:

Marshall Combo Fender Princeton Music Man HD 100 Mesa/Boogie (one 12'' compact) Marshall (100-watt half-stack) Roland Cube 60

Keyboards:

9' Baldwin grand piano Yamaha CP-80 electric grand piano Yamaha CP-80 electronic piano Yamaha CS-80 synthesizer

Basses:

Fender Precision Bass Fender Jazz Bass Music Man Bass



technology at your disposal and just how much of it you should use to make your music. See, that's the whole fight. That's the bitch. Trying to find that balance between emotion and machinery. It's a constant fight for me. There's all this technology and yet, I can't tell you the name of the microphone I'm using. I just know I like the way it sounds. And that's how it is making this record; I can't tell you the names of the equipment we're using, but I can tell you if I like the sound of it.

"For me, I have to try and find the right balance. I have to find that place between what sounds great emotionally, you know. 'from the gut, first take, put it out, I love it' kind of thing and what I also know needs to be done to get the thing technically correct. I'm constantly looking for that balance between the gut and the technical side. But yet, I don't care what anybody says. You are not going to get emotion singing a song 100 times in a row. There's just no way. There comes a point when you strive for that perfection and miss the whole feeling of the music, and that's a trap I don't want to fall into.

"This whole recording process is hard for me because I grew up listening and loving people like John Cale and Lou Reed, and they never gave a f--- what their records sounded like. [Laughter] You think that's why they never get played on the radio?"

Case in point: Although John Cougar has all of the advanced technology known to modern day man at his disposal, he is most happy today with a song he wrote and recorded in only ten minutes on the studio's twotrack machine.

Cougar punches up "Cat's In The Kitchen" and Studio E is filled with a rockin' little record I want my DJ to play. Cougar's vocals strut out in front of The Zone's sonic assault...it's raw, it's rough, it's beautiful rock 'n' roll, and, of course, Cougar wants to put it on the album just as it plays.

Stebbits and Gehman have other ideas, though. "See what I mean," Cougar laughs. "There's that balance again. Sometimes I wish I could just make a record like Buddy Holly." He surveys all the flashing electronics before him. "I mean, really, sometimes I seriously wonder just how much of this stuff I really do need to make my music."



If there are legends in the recording industry, surely Bones Howe is one of the originals. After graduating from Georgia Tech with a degree in Electronics Engineering, he eschewed a lucrative offer from the Howard Hughes Corporation in favor of a job as a recording apprentice at Radio Recorders in May of 1956. "They couldn't believe that a person with an engineering degree would be an apprentice for \$72 a week." But from then on, it was straight up. Bones' first chart hit in 1958 with "Purple People Eater" opened the door to a string of successful artists like Henry Mancini (Peter Gunn album), and (at United Recorders) the Fleetwoods, Jan and Dean, the Everly Brothers and Bobby Vee, to name a few.

Things were really starting to open up in the recording

business in the mid-sixties, and Bones was right in the middle engineering the Mamas and the Papas, Barry McGuire and Johnny Rivers, while producing the Turtles, the Association and the Fifth Dimension.

When the 1970s rolled around, his eye for talent stayed as sharp as ever with his discovery of Juice Newton, and his work with Martin Mull, The Alessi Brothers, Jerry Lee Lewis, Sergio Mendes and Ahmad Jamal.

MR&M caught up to Bones in Hollywood where he's currently completing the soundtrack for Francis Ford Coppola's movie One from the Heart with music by Tom Waits. The conversation starts with a reaction to his excitement about his latest artist. Modern Recording & Music: Was it his spontaneity and energy that attracted you to Tom Waits?

Bones Howe: He wasn't that way when I met him. He was much more reserved than he is now. We were brought together by David Geffen when David was in charge of Asylum Records. At that time, Waits sounded like a Bob Dylan derivative; David played me the first album and some demos. There was a jazz quality to the demos, and his lyrics and writing had a (Jack) Kerouac quality. Having worked in that medium in the 50s by putting together a Kerouac album and engineering and supervising tons of jazz sessions, I liked the material immediately. Those qualities were my original reason for getting into the business. Tom and I met, talked about Kerouac, started trading tapes, and that was the beginning of our relationship. Our first album was The Heart of Saturday Night, and for Tom it was a successful album-not a million seller, but it got on the charts and established him as a singer/ songwriter.

What really attracted me to Tom was that he had some very interesting things to say. He's truly an artist in the sense that he does create something completely unique. A lot of recording artists don't do that. They may have a sound that's a little different, but every pop recording artist is a derivative of something. The secret is just how cleverly you derive. The artists that keep coming back year after year are the ones that come up with new ideas, new material and have something interesting to say.



MR&M: As his producer, what do you feel is your main objective?

BH: With Waits it's finding the best way to present the music. A lot of what I do is done before going into the studio as opposed to doing multi-track layering in the studio. Even though the music is a performance, there is a lot of pre-production. We have to know how big the instrumentation is going to be; what the mic set-up is going to be; what the setting is; and then create that setting. By setting I mean environment. For one album, we rented out the back of the Record Plant here in Los Angeles, and transformed it into a club complete with beer, wine, potato chips, tables, candles, lighting man

and a stripper for the opening act. For two nights we had a line of people outside that stretched around the corner.

In terms of instrumentation, it may be anything from just drums and bass, or piano and bass, or just solo piano, to a full orchestra with strings. Every one of his tracks was recorded with no overdubbing—all "live" to the 2-track like an old-fashioned recording session. We turned the tape on and all the mixing was done during the performance.

"With a pop group, there's an implied understanding that you're supposed to be cutting hits."

The idea being to catch a spontaneous performance, because Tom is that kind of performer. You can't do that with the Association who have so many vocal overdubs to do.

You have a different kind of responsibility with a pop artist than with someone like Waits. When working with a pop group, there is an implied understanding that you're supposed to be cutting hits. Over the years, my philosophy has evolved into one of doing as much as I need to do, yet not forcing myself on an artist to make him produce. Tom and I decide where we want to go together by sitting and talking about it.

MR&M: What direction have you picked out with Tom, more album sales, more AM play, more FM play?

BH: The only direction we're trying to go in is to direct his material into a more contemporary rhythm structure so he'll be more accessible to the average listener. People thought he was an old jazz or blues guy, because of the sound of his voice. *Heartattack and Vine* has more of a New Orleans or early Rolling Stones feel; it's hard to define what it is. "Jersey Girl" has more of a Phil Spector feel, and I think that's what attracted Springsteen to it; it has the same early rock quality.

MR&M: Tom has a unique vocal

quality. Is that a hindrance or an asset?

BH: Tom is a true cult artist; he has a cult following. Each one of the albums I've made with him has sold more than the album before it. As the new one becomes a chart album, all the rest sell in proportion and catch up. All his albums have sold almost exactly the same number of records. I've done six or seven albums with Tom, and every time we do a new one, it picks up more fans, and they go out and buy all the old albums. There is no such thing as Waits' albums being cut out of the catalog at the record company; they're all in the catalog. His uniqueness on the recent album is consistent.

The sound on the new album is "small." The concept of the soundtrack does not call for a huge orchestra. It's as though the sound was recorded in a piano bar. The film is a musical comedy about small people. Tom wrote a lot of humor into the songs with an overall jazz musical quality.



BH: There's never just one reason for anything. My relationship with the studio stems from a personal friendship with Wally that began in the 1950s. We were both into jazz and big band and we'd exchange tapes. When Wally opened his first studio, it was a small room primarily for vocal overdubs. The second room, Studio 3, was patterned after Studio 3 at Western, where he and I worked together. The equipment, of course, was newer, and he had an excellent monitoring system. The drum sound was a lot better, the isolation was every bit as good and the console was a lot more flexible.

I developed a good working relationship with the girls in the traffic office, which gave me the luxury of being able to book time on short notice. If I needed to cancel on short notice, they were always real good about not charging me for the time. This is one of the pluses of developing a good relationship with a studio over a number of years. That works out to the benefit of the artist you're producing. It keeps the budget down if something comes up, and the session can't go on.

I'm always dealing with the same people. I've got a place in the parking

"Records that are free (of discipline) don't go anywhere; the ones that are structured in some way -- that's art."

lot. It's all those little things that, when you're running on a tight schedule, turn out to be real important. But I would not be working there if I didn't feel the studio was one of the best. Peter Butt has a great maintenance department. I have very little down time considering all the time I spend there. The primary concern of a studio is good sound and reliable equipment. Cost is really secondary; that's just a matter of organizing your time properly-assuming that the studio is not outrageous in price. From then on, the other things are conveniences, and they do make a difference.

I also think that the studio manager Janna Feliciano has made big improvements. I've been there longer than anyone except Wally, and I've seen managements come and go. I think Janna is the first manager since Wally that really knows how to run a studio. If there's a problem, people respond immediately. With Janna, if I just mention something to her off-hand, the next time I come in, she'll tell me, "Oh, by the way, we took care of that problem." It could be something that wasn't even a problem. She'll say, "Well, I don't even want little things wrong." Somebody who is that compulsive about cleaning up even the little things, will never have to worry about any big things happening.

MR&M: In one of your previous interviews you made the statement that "Mixing is a matter of perspective, not loudness." Are you equating perspective with presence?

BH: Let me define presence real quick. Presence is the absence of room sound. The instrument or voice with the most presence will inevitably sound the closest to you. At low level, it will pop out of the mix. If you use the philosophy of mixing by perspectives rather than mixing by level, you compensate for the Fletcher-Munsen effect. This kind of mixing also eliminates many problems with the EQ-ing of instruments from a sound standpoint. You make it possible for the finished recording to be played on a variety of transducers including speakers, earphones or whatever. (My acid test is playing music through a 6x9 speaker in a Volkswagen going at 60 miles per hour on the freeway with the windows rolled down.) In the early days of engineering, nobody really knew very much about sound recording. We found out everything the hard way, and the basic philosophies and techniques carry all the way into digital recording. We were starting from the ear and working forward instead of from the microphone and working backward.

MR&M: How does that translate into present day situations?

BH: It doesn't mean just adding high end to the sound to bring out the presence. People used to say to me, "Put a little on at 3 kHz and that will pop it right out." It's not just that. It has to do with peaks and valleys of the waveform getting less and less sharp as the sound source moves farther and farther from the microphone. You get reflected information coming off the walls and other surfaces in the room in a relatively short time frame that gets added to the waveform. It takes the edge off the sound.

A lot of engineers like to put baffles or gobos around everything to cut out the interference. I've never done that. I was a musician before I was an engineer. I feel that the engineering is there to serve the performance. The only time I ever put baffles around anything is when I'm trying to record acoustic guitar with a rock and roll rhythm section. Then it's a matter of self-preservation for the guitar.



MODERN RECORDING & MUSIC

Now there is a move back to open sound, and it's real easy to do-just take the baffles away. Give the sound some room to develop. Presence reduces down to how far the subject or source is from the mic.

You can do a much better job in the studio if you realize that what you're doing is creating an illusion. That's not 115 musicians coming from that little 15-inch speaker; they are not playing in that box, no more than it's those people that you see on the screen at a movie. It's an illusion, but we allow ourselves to be fooled. So if you have a 15-inch hole/speaker for the music to come out of, something has to take priority. Once you know the priorities, it becomes easy; it's a craft, a discipline. You're going to paint a picture, but you have a small frame to get it in. It's much easier to be creative if you have a starting discipline than if you have no discipline at all. Records that are free don't go anywhere. The best records are the ones that are structured in some way; that's art.

Depth can be created by echo or reverb or delay, but as an engineer, you should try to reduce what you're doing to the simplest terms. It's like a photograph; it has its perspective. You have things that are close, and things that are far away. If everything is close, it will have no depth to it. It's the same thing with a recording. You need those lines of perspective in mind. For instance: if you're making a pop record, you must understand what things pop out on a car radio or a small speaker. Girls' background voices come crashing through on them; you practically can't turn them off. Sometimes the farther you turn them down, the better they sound. If you build a little echo around them to add some substance and push them back, they'll come out in a way that the listener will listen through the music down to them.

An engineer can be like a chauffeur; he can sit there in the driver's seat and be told where to go, or else he can be creative enough to look beyond what's happening to add some substance to the recording. I don't care how dumb the music is. One of the toughest things I encountered when I was engineering was the session where the music was dumb and boring. If I hadn't had a desire to do something interesting with the sound, I would have been banging my head against the wall, and out of the business long ago.

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You might ask, as did *MR&M*'s editors, concerning this "Notes" column, "Why am I reviewing vocoders?"

Vocoders certainly aren't breaking any sales records, and have to pay an inordinate amount of money just for the privilege of making your axe "say" a word or two. Aside from a few musicians who use the vocoder proficiently (Kraftwerk, Laurie Anderson and Yellow Magic Orchestra come to mind), vocoders have generally been considered useful gimmicks at best and expensive nuisances at worst. In fact, at least one prominent manufacturer has stopped production on its vocoder due to lack of sales. So don't think that I'm reviewing vocoders because they're going through some kind of renaissance; they most certainly are not.

However, they should be. A vocoder is just as flexible and valuable a device as a good delay line, and the cost is comparable. I'm sure that some of you are shaking your heads in disbelief at that statement, after all, with a delay line you can do echo, chorusing, vibrato and flanging—while with a vocoder, all you can do is robot voices and make your guitar say something profound like "thank you very much" to the audience. But are those really the limits of the vocoder? Read on for the answer...

WHAT are THEY? Vocoders traditionally give an effect similar to a highly sophisticated talk box; however, these vocal effects are obtained by superimposing speech characteristics onto the instrument through all-electronic means, not by sticking a piece of tubing in your mouth as in the case of the talk box. A vocoder has two inputs, one for an instrument and one for a microphone (or more importantly, other signal sources). Talking into the microphone superimposes vocal effects onto whatever is plugged into the instrument input. Since vocoders are complex and employ a fair amount of circuitry, they are pretty costly.

Using a fairly simple eight-stage vocoder as an example, the microphone signal output splits into eight different filter sections (see *Figure 1*). Each filter section covers a specific part of the audio spectrum; this part of the vocoder is electronically similar to a graphic equalizer. The reason for splitting the mic signal into these different filters is as follows:

With human speech, different sounds are associated with different parts of the frequency spectrum. For example, an "S" sound contains lots of high frequencies. This means that when you speak an "S" into the microphone, the higher frequency filters that the mic output feeds will have an output when an "S" sound occurs, while there will be no output from the lower frequency filters. On the other hand, plosive sounds (such as "P," "T," and the like) contains lots of low-frequency energy. Therefore, speaking one of these sounds into the microphone will give an output from the low-frequency filters, while nothing will come out of the higher frequency filters. Vowel sounds will produce outputs at the various midrange filters. As an experiment to illustrate this, say "A-E-I-O-U" in a nasal "robot voice" where you say each vowel with the same tone and inflection. This experiment shows that you can derive the different vowel sounds by simply bandpass filtering a tone at different frequencies.

Confused? That's understandable, because we need to look at why these filter outputs are important to the system as a whole before you can expect to understand how a vocoder works. So, let's proceed over to the instrument input.

An instrument plugged into the vocoder is again split into a bunch of different filters, which have identical frequencies to the filters used with the microphone input. However, these filters include VCAs (voltage controlled amplifiers), so that the filter output levels may be controlled by the presence of a voltage.

Now consider what happens when you play a note into the instrument input while speaking into the mic input. If an output occurs from the mic's lowest frequency filter, then that output controls the VCA of the lowest instrument filter, and passes the corresponding frequencies from the instrument. If an output occurs from the mic's highest frequency filter, then that output controls the VCA of the highest instrument filter, and passes any instrument signals present at that frequency.

As you speak, the various mic filters produce output signals that correspond to the energies present in your voice. By controlling a set of equivalent filters connected to the instrument, you superimpose a replica of the voice's energy patterns on to the sound of the instrument plugged into the instrument input. This produces highly accurate and intelligible vocal effects. In many cases, the mic input is referred to as the "analyzed" input, since this is the signal that is "analyzed" in order to superimpose the vocal effects onto the instrument sound.

There are some terms associated with vocoders that we need to understand before we get into the review. These are:

Resolution: Human speech patterns are very complex, and the more filters you can use to analyze these patterns, the greater the intelligibility of the vocal effects occurring with the instrument channel. Therefore, although so far we've only shown eight bands of filters in the block diagram, some vocoders have up to thirty-one filters spaced at 1/3-octave intervals over the full audio bandwidth. The more filters, the greater the resolution of the vocal analysis.

Pitched and Unpitched Sounds: Many speech components that contribute to intelligibility are in the upper midrange and high frequency regions, yet very few instruments have significant amounts of energy in these parts of the frequency spectrum. Therefore, if you're trying to vocode something like a drum or bass, and you say the letter "S," even though the instrument high-frequency filters will respond, there will be no significant amounts of high-frequency energy available for the filter to work on. Various vocoders attack this problem in various ways, which we'll discuss later in this article.

Incidentally, the vocoder is not a recent invention; it was developed by Homer Dudley in the late 1930s for telephone technology applications. The idea was to see if it was possible to convey voices over long distance lines by indirect means (i.e., vocoder modulation), as opposed to simply amplifying a signal and sending it through the wires. As it turned out, the vocoder did not provide the hoped for solution to more practical telecommunications; but like many of the other technical developments to filter down from telephone technology, the vocoder had applications outside of the field of telephony.

Using only a microphone with a vocoder wastes much, if not most, of the vocoder's capabilities. I've found that using vocoders for cross-synthesis, where one instrument controls another instrument, opens up a number of interesting applications. *Figure 2* shows one such patch. In this example, I've recorded a heavily distorted (but nonetheless tonal)





chorded keyboard part on a tape track. I then patch up to play a drum track, with the drums acting as the analyzed input and the keyboard tape track acting as the instrument input. The drums then go into the mixer, with the vocoded (well, "drumcoded," actually) keyboard part mixed in with the drums *at a lower level*. The sound is amazing! Depending on how heavily you mix in the keyboard track, you can get subtle effects that sound like the drums are more electronic and tonal, to overbearingly oddball rhythmic effects.

Another trick with drums is to plug a mic into the analyzed input, and simultaneously feed the drums into the instrument input and the mixing console (*Figure 3*). The vocoder output again gets mixed way back with the drums. As you speak, cough, make rhythmic bird noises or whatever, the vocoded drums add an extra dimension of effect to the overall drum sound. It's wild, it's very electronic and it leaves people wondering, "How did you get that drum sound?"

With a vocoder, you can use your voice to add emphasis to keyboards, guitar, tape tracks, whatever. Make louder sounds and the instrument will get louder; sing a tone that sweeps from low to high, and you'll hear the various instrumental harmonics march by...and there's lots more you can do. Remember, though, to mix the vocoded sound *behind* the main instrument sound: that avoids the cliched robot voice effect.

IN THIS CORNER: We were able to get our hands on three vocoders for this review, the VC-10 from Korg (list \$1299); the SVC-350 from Roland (list \$995); and the Bode model 7702 (list \$3,500). They all seem to be designed with different purposes in mind.



Fig. 2

The Korg VC-10: The Korg VC-10 differs from the others in that it includes a built-in 32-key keyboard; this provides a built-in instrument sound. There is also an external input for when you want to use other signal sources. The keyboard features an octave up/down switch, pitch bend wheel, chorus effect with on/off switch and adjustable vibrato speed/depth, tuning control, "accent bend" (introduces pitch wavering at the beginning of notes to add a more human effect) and an external pitch control that responds to an external $\pm 3V$ control signal. However, for some strange reason you cannot access the keyboard output and use the keyboard separately from the vocoder.

Since it's crucial to pump as much signal level as possible through a vocoder (short of distortion, of course) in order to minimize noise, all three vocoders include input level setting aids. The VC-10 includes an analog meter, along with a meter select switch that allows you to choose between monitoring the analyzed input or instrument input levels. There are separate level controls for the two inputs.

Other controls include a final output control, balance control (sets the ratio of mic and vocoded signals) and an interesting control that pans the instrument input between the internal keyboard and a noise source. There is also a built-in headphone amplifier with headphone jack and level control. Other jacks include mic input, external (instrument) signal input and external pitch control input. Construction is okay, but the unit itself is relatively bulky and unconventionally shaped—you're certainly not going to be able to stack another keyboard on top of it.

The Roland SVC-350: The SVC-350 is part of the Roland "Rack Series." and fits in a standard 3.50-inch rack panel. The analyzed input includes XLR and ¹/₄" jacks, with an



Fig. 3

MODERN RECORDING & MUSIC

associated level control and green/red (for safe/overload) LED level-setting indicator. There are two instrument inputs: "instrument" and "guitar." The instrument input does not include any processing, and has a three-way switch (marked -30, -15 and 0 dB) to match the vocoder to the instrument signal level. The guitar input goes first through a compressor and then through a fuzz circuit with adjustable overload control (labelled "harmonics"). Both of these inputs again have a green/red LED overload indicator to aid in level setting.

Vocoder controls include balance (to adjust between mic and vocoder levels) and an eleven-band pseudo-graphic equalizer called "voice character control." This allows you to alter the tonal quality of the vocoded signal, and I found it most useful.

There is also a stereo chorus circuit included in the SVC-350 that is downright luscious. However, the only way you can turn this on and off is with a footswitch, or by plugging and unplugging a plug from the jack marked "ensemble." There are no controls for this circuit, but you won't mind; the presets are all in the right place.

Like the Korg, the SVC-350 includes a built-in headphone amp with headphone jack and level control. There's also a final output control that affects the overall level coming out of the various output jacks.

There are three rather enigmatic output jacks, labelled "guitar amp," "vocal amp—B" and "A+B-A." After some head scratching, I figured out that the guitar amp jack was for feeding a guitar amp (that wasn't too hard), while the other two jacks are stereo outputs from the stereo chorus that are designed to feed a P.A. There's also a three-way switch associated with these vocal amp jacks marked H-M-L for high, medium and low level output. If you only had a mono setup, you would use the jack called "vocal amp—B." So, you can rest assured that among all these jacks you'll find something capable of interfacing the unit to the real world, mono or stereo.

Other jacks include a hold jack (plugging a footswitch into this holds a tone color until the pedal is released; this helps

bridge gaps that might occur while the vocalist is pausing for breath) and a vocoder/direct jack, which allows (using a footswitch) switching between the vocoded sound and the microphone sound.

The Bode 7702: This unit is built more like a precision piece of lab equipment than a studio peripheral, and fits in a 7-inch rack panel. Unlike the Korg, which uses eight filters, and the Roland, which uses eleven filters, the Bode Vocoder uses sixteen channels for excellent vocal resolution. The analyzed (mic) input includes a level control, jack and mic/line switch (this was the only unit to recognize that you might want to put something with a much higher level than a mic through the mic input, by the way). The instrument input (called the "carrier" input on the 7702) includes a level control and input jack.

One of the main distinguishing features of the 7702 is the way that sibilants (those high frequency unpitched "S" sounds) are handled. The Korg simply allows you to mix in some noise, so that sibilants pass some noise to the output; unfortunately, the noise also passes through to the output when sibilants are not present, but in a lower frequency range. The end result is that the VC-10 sounds like it has a case of modulation noise.

The 7702 includes two ways of passing sibilants. First, there is a high pass filter that directly bypasses sounds present at the microphone input in the range of 5080 Hz to 15 kHz. Thus, "S" sounds bypass the vocoder section entirely and appear at the audio output. If this sounds too human, you can also introduce noise only in the presence of sibilants and other high-frequency energy by operating two other controls—a three-position rotary switch and a balance control. The three position switch chooses between the noise sound only ("hiss"), normal vocoded sound only ("buzz") or a mix of noise sound along with the vocoded sound. In the mix position, you may then alter the balance control to set the correct blend of hiss (pink noise) in the final output.

Other controls include a three-position, spring return



track/hold toggle switch (pressing down maintains the tone color for as long as the switch is depressed; center position tracks the analyzed input; and pressing up locks the tone color for up to several minutes or until the switch position is changed again). There is also an output jack and a vocoder/bypass switch.

One useful feature of the 7702 is a patch bay between the analyzed channel's outputs and the instrument channel's VCAs, since this allows you to have different analyzed filters controlling different instrument filters. This is a rich source of tone creation; you can shift the frequency spectrum of a male voice upward to create a more female voice sound, or shift it downward to make a deep voice sound. Random cross patching produces speech scrambling effects. There is a switch that selects between normal vocoder operation and whatever strange patch you might have set up, which means that you don't have to frantically tear down patch cords when you want to go from munchkin sounds back to the real world.

EVALUATING the THREE VOCODERS: This is already turning into a pretty long piece, so we'll hurry along and get to the bottom line evaluation on all three units.

Korg VC-10: As luck would have it, shortly after the VC-10 arrived for evaluation I received a frantic call from a company that wanted me to write and record a one minute radio spot in less than 48 hours. I thought some vocoded voice effects would be nice; at that point I hadn't tried any of the vocoders, but since time was of the essence I unpacked the Korg and hooked it up. Yes, it worked, and yes, the company loved the ad. So, in that respect, the VC-10 is successful. However, I have three major complaints about the unit. First, you can't use the keyboard by itself, which would have built some extra value into the unit. All that would have been needed was a separate jack in order to accomplish this. Second, the noise level is definitely noticeable. It's hard to make a quiet vocoder, for sure, but both the Roland and the 7702 were noticeably quieter. Third, the resolution you get with eight filters just isn't all that great, so for intelligible vocal effects I needed to add a fair amount of straight sound in with the vocoded sound. As a plus, the white noise instrument option was great for making supernatural crowd sounds, although of course plugging a white noise generator into any vocoder would produce similar results. I'd say that the Korg's main value is that it's a completely self-contained unit that's easy to set up. The sound quality, however, was not as consistent as the other two units.

CIRCLE 1 ON READER SERVICE CARD

Roland SVC-350: While lacking the vocal resolution of the Bode vocoder, the SVC-350 is a highly appealing tool that has great musical value. In particular, the stereo chorus (ensemble) is an absolute knockout for choir sounds. Patch a good string synthesizer (with narrow pulse waves) into the instrument input, make sure the ensemble is on, sing some "ooooohs" and "aahhhhhs" into the microphone they don't even have to be on key, although it helps greatly—and you've got a dead ringer for the Vienna Boys choir. Playing in a different range on the keyboard or altering the voice character controls can turn this into a male or female choir. I don't know whether it was just the string synth I was using, the way I was mouthing into the microphone or what, but the human choir sound that I heard out of the SVC-350 was exceptional. The Korg chorus unit, while all right, just didn't give the lush sound I experienced with the SVC-350.

There is some residual noise that you can notice with the SVC-350, but there is enough noise gating or whatever to minimize this problem. Although it is the least expensive of the three units tested, still the SVC-350 is not cheap, but you certainly can't argue with the quality of the sound. This vocoder is a fine, musically useful device that is worthy of any musician possessing enough creativity to use it imaginatively.

CIRCLE 2 ON READER SERVICE CARD

Bode 7702: The Bode 7702 is the Mercedes of vocoders, and like a Mercedes, it ain't cheap. Its list of owners look like a who's who of electronic and pop music: and you've probably heard the results of Mr. Bode's design blaring out of more than one transistor radio on a hot summer day at the beach. The noise level is, for all pratical purposes, insignificant; the vocal intelligibility is superb, thanks to the many ways in which sibilants can be handled; and the patch bay adds a whole new dimension of sound that is not realizable with the other two units I've reviewed. But while the 7702 is an excellent vocoder, it does not have any frills. If you want chorusing, you'll have to add an external chorus unit. There is no way to alter the timbre, as you can with the voice character controls on the SVC-350, and there is no built-in headphone amp (no big deal for me and other studio-oriented people, but it might matter to an onstage performer). The Bode 7702 strikes me as being a nononsense, no-compromise device that is designed specifically for applications involving the human voice.

CIRCLE 3 ON READER SERVICE CARD

OVERALL EVALUATION: Overall, the Korg VC-10 is okay for being a self-contained and easy to set up vocoder, but it lacks the sound quality of the other two units. The Roland SVC-350 would be the vocoder of choice for those who are interested in experimenting with such things as cross-synthesis and who would like to be able to synthesize a choir from a single keyboard and vocalist. The Bode 7702 is for those people to whom vocal intelligibility is paramount. For example, for serious advertising work you would really have no choice but to lay out the bucks for the 7702; while it's clearly suited to many other applications, vocoding is what it does best—and it vocodes superbly.

Playing with these devices has convinced me that reports of the death of the vocoder are definitely premature. Perhaps part of the problem is the name; people think only of vocoders in vocal contexts. But they are so much more flexible than that, and the only way you'll find out is to experiment with a good vocoder. (By the way, if you're at all turned on by the synchrosonic recording process the vocoder is almost a dream come true.)

If you do decide to check out a vocoder, don't even plug in a mic for at least the first few hours, you might be amazed at some of the sounds you can generate using crosssynthesis techniques and modifying tape tracks with other instruments. When it comes to advanced playthings, the vocoder is a lot more versatile than most people suspect. Copyright 1982 by Craig Anderton

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Thanks to T. Roth & Another Pretty Bace for their prevy faces! Photographed at Minot Studios, White Plains, NY



By Len Feldman

The Great CX Debate

I must confess that every once in a while I become convinced that the audio industry harbors its own secret death wish. I had this feeling, for example, during those barely remembered days of quad sound in the early and mid-1970s, and, unhappily. I'm getting that feeling again. It gets worse when I read some of the critical articles which have been appearing of late, relating to CBS's new CX recordings. I went through the same sort of thing shortly after dbx introduced its encoded discs. All the self-appointed experts had started writing about how they could hear all kinds of "pumping" and "breathing" as the dbx decoders did what they were supposed to do to expand dynamic range during playback and to just about obliterate any audible noise. These same experts never mentioned the incredible 90 to 100 dB of dynamic range that was made possible by the dbx discs, nor did they describe that wonderful sensation of being able to sit down, start a disc going and not be subjected to that ever-present lead-in-groove surface noise which had almost become an aural clue that we were listening to a record. What they did talk about (besides "pumping" and "breathing") was the fact that the dbx records were incompatible-you had to have a special decoder hooked up to your sound system to take advantage of the noise-free, wide dynamic range dbx discs. If you tried to play them without a dbx decoder, forget it. They sounded terrible!

So along comes CBS Records, with the aid of their laboratory facilities in Stamford, Connecticut, CBS Technology Center, and develops a *compatible* disc which reduces background surface noise by some 20 dB, expands dynamic range to better than 80 dB *and* is "compatible" to the degree that the listener who is *not* equipped with an appropriate CX disc decoder can listen to the discs played on ordinary equipment and still enjoy the music or other program material. Does the world of professional audio rejoice? Hardly! Every recording engineer from every two-bit recording company becomes an expert in noise reduction technology overnight and begins pontificating as to "what's wrong with the CX system." This, of course, has somewhat of a mushrooming effect, in that the recording artists (few of whom are known for their dispassionate, cool approaches to situations that might have an adverse effect upon their annual earnings) begin to run scared. Many of them, not even having ever *heard* a CX record with or without CX decoding, decide that *they* don't want to take a chance with this new kind of record because if listeners don't like it they (the artists) will be immediately toppled from the top-ten (or top-forty or top-100) lists, perhaps never to return.

There are other industry critics of CX who ascribe all kinds of sinister motives to CBS and CX. These "experts" are convinced that CBS has gone to the trouble of introducing the CX concept only so as to postpone the inevitable day of transition to true digital audio discs. The reasoning of these sleuths goes something like this: CBS Records has too much invested in conventional analog disc technology (pressing plants, etc.) and needs more time to ammortize its investments, so they have come up with a "compromise" system that reduces surface noise and increases dynamic range just enough so that the public will stop clamoring for digital audio discs. This "plan" will delay the introduction of the compact digital audio disc that everyone's been talking about since Sony and Phillips demonstrated it earlier this year.

What nonsense! Nothing in this world can stop the compact digital audio disc from making its debut and, ultimately, from becoming the dominant program source of the future. The digital disc players will arrive when Sony, Phillips and their licensees decide that they can make them and distribute them profitably and reliably no sooner and not a moment later. Both dbx and CBS have acknowledged this publicly on several occasions. But does actually that mean that all other technology in the recording field should come to a grinding halt while we wait?

Suddenly We Hear Compression

As for the "technical" criticism of CX itself, it generally centers around the fact that CX encoded records, when played back without decoding, sound somewhat compressed under certain program source conditions. I regard that as somewhat of a hypocritical indictment. Let's face it, recording engineers have been compressing sound to fit it onto tape and disc ever since electrical recording replaced the acoustic horn recordings of the early 1900s. If they didn't compress "live" music it wouldn't fit onto records. The chief difference between the new CX technology and earlier discs when both are played without any attempt to re-expand the previously compressed sounds is that the CX disc compression follows a carefully worked out and consistent compression formula which can therefore be consistently re-expanded in accordance with a converse formula. Conventional records, in contrast, are arbitrarily compressed by a wide variety of electronic compression devices and an even wider variety of recording engineers, each of whom "knows what's best" for the music and the musical artists. Anyone who has tried to use a single-ended expander during playback of conventional records knows that there is no one setting that works for more than one record, and, in some cases, there is no expansion setting that works well at all.

In other words, it's the guilty parties who are criticizing CX because it compresses music in an ordered fashion while they compress it in a random manner. But putting that aside for the moment, it strikes me that there's something else about all this criticism that doesn't make sense. Most of the criticism centers about how undecoded CX records sound, while little or nothing is being said about how great they sound when they are played back through a proper CX decoder. After all, the system was invented so that we could enjoy improved dynamic range and substantially reduced surface noise. The fact that we can listen to CX records without decoding (but also without the benefits of CX) is, to be sure, a worthwhile aspect of these discs, but it is a secondary benefit and not the primary one.

The situation reminds me of the time when we were considering several systems for creating a standard for stereo FM broadcasting in the late 1950s and early 1960s. For some still unfathomable reason, the FCC chose a system that introduced the least deterioration of the mono reception quality, but provided a very poor signal-to-noise ratio in stereo. In other words, they were more concerned with those listeners who would not listen to FM in stereo than to those who would adapt to stereo. As things turned out, of course, a majority of FM sta-

tions now broadcast totally in stereo and millions of listeners have stereo FM receiving capability. But, by favoring the status quo instead of looking to the future, we were all saddled with a noisier and more multipathridden stereo FM system than we need have had. In the same sense, the critics of CX who address their criticisms towards how the discs sound without decoding are discounting the possibility that within a couple of years there will be so many CX discs out there that millions of people will want to hear them as they were meant to be heard-properly decoded with CX circuitry. And, of course, as the CX circuit is reduced to a small single chip, its cost will come down and it will find its way into even the lowliest of receivers and amplifiers, so that we can expect the hardware bottleneck to ease up. If CBS Records refuses to become discouraged, and if the other record companies who have taken licenses from CBS are not scared off by the negativism of a few self-appointed experts, we should also have an ample supply of software in a matter of a few months and CX will be on its way. After all, dbx, Inc., a small company compared with CBS, has managed to introduce a surprisingly large number of music lovers to the joys of noise-free wide dynamic range recordings through its issuance of the dbx encoded discs which now number well over 100, with more releases coming all the time. If they could accomplish that with a type of record that must be played with a dbx decoder, I would hope that CBS "and friends," with all their clout and aided by the fact that their CX records can, after all, be played without a decoder, should be able to capture a significant share of the record market in CX format.

It's interesting to note that record *retailers* are not unhappy about CX. After all, if CX leads to a singleinventory situation, as CBS says it can and will, then they won't have to go through another doubleinventory situation such as existed when we were first making the transition from mono to stereo records (before stereo records became compatibly playable on mono phonographs). No retailer can be against that idea. And as for delaying the arrival of compact digital audio discs, most of the record dealers I've spoken to don't even know that the DAD is coming, and those that do think of it as being so far into the future as to not in any way affect their current business thinking and planning.

One last interesting point: makers of videodisc players, including RCA and Pioneer, have indicated that *they* will adopt CX for the audio tracks of their discs. In other words, the videodisc player makers—who certainly have marketing troubles at this point—are smart enough to incorporate anything that makes for better performance. One would think that the record industry, which hasn't exactly been riding high in recent months, would exhibit the same kind of wisdom. NORMAN EISENBERG AND LEN FELDMAN

Nakamichi 700ZXL Cassette Recorder

ern 2DING

General Description: The Nakamichi 700ZXL is "one step down" from the model 1000ZXL (MR&M, June 1981). It weighs about eleven pounds less, and it is priced somewhat lower, but it retains most of the features of the model 1000ZXL. It is, most observers agree, more stylish-looking than the 1000ZXL. The 700ZXL has the self-calibration process known as "A.B.L.E." which stands for azimuth, bias, level and equalization, and which is accomplished automatically by microprocessor. In the 1000ZXL, this process included the deck's ability to automatically identify generic tape types. In the 700ZXL the user must operate a tape-selector switch and an EQ switch before the A.B.L.E. process begins. Another difference between the two decks is that the 1000ZXL has a control that permits the operator to deviate from what the deck's built-in "brain" regards as the optimum bias setting for a given tape. In the 700ZXL that control is missing, and so the main criterion for optimum bias becomes, in accordance with the deck's design philosophy, that setting which provides the widest and most linear frequency response.

In other respects the two decks are quite similar. The three heads (erase, record and play) are physically as well as electrically discrete, and azimuth adjustment of the record head is provided as part of the "A.B.L.E." feature. Also included in the 700ZXL is the "RAMM" (random access music memory) feature which may be used to record an inaudible signal on the blank portion of tape between selections, or during a given selection, which then may be used to program the machine for desired stops and starts. A memory option permits locating the start of any selection and to automatically play or repeat it. The logic-controlled transport is operated via feather-touch buttons with fast button options between any modes. A cueing facility is provided



BPORT

for hearing a tape when in rewind or fast-forward—it is engaged by pressing the pause button after having activated rewind or fast-forward.

Calibration data for four different tapes, as well as noise-reduction data, can be stored in the deck's memory; the memory functions on batteries when AC power to the deck is removed.

The front panel has four main sections. Across the top are the indicators for automatic calibration, tape type, playback EQ, noise-reduction, four-figure digital tape counter and LED signal level display which is calibrated from -40 to +10 dB.

The large left-half center of the panel contains the cassette compartment with the transport buttons below it. To the right are various controls including: playback pitch; timer (for unattended record or play with an external timer); memory; a blend mic level control for a mono center microphone which also can be mixed with the other level controls; separate level for left and right microphones; output level; main tape selector; main EQ selector (70 or 120 usec); noisereduction selector; built-in test tone switch (400 Hz for use in level calibration with other audio components); filter for MPX and subsonics.

Across the botton of the panel are the main power switch; headphone jack; the RAMM controls; the auto calibration controls; the counter reset button; the source/tape monitor switch; the tape data memory controls; a button for setting playback EQ or noisereduction manually; and finally, the line input controls for left and right channels. The rear of the deck contains three microphone jacks (left, right, center); line in and out jacks; a special jack panel for interfacing an external noise-reduction system; the compartment for the memory batteries; an AC voltage selector; two remote control connectors for the tape transport and for the RAMM system; the power cord; a grounding terminal.

Test Results: Performance of the Nakamichi 700ZXL was generally similar to that of the 1000ZXL, with the costlier version just nosing out the new model in some areas, although the 700ZXL actually had a lower wow-and-flutter measurement. Be that as it may, the 700ZXL did confirm or exceed its published specifications, and operation through all its options and functions proved flawless.

With the "A.B.L.E." activated, the deck was measured for various parameters. For the -3 dB point, response at the -20 dB level went to beyond 25 kHz for all three tapes tested (Nakamichi EX, ferric oxide; SX, chrome-equivalent; ZX, metal). The results are shown in *Figures 1, 2* and 3.

We were provided with Nakamichi's new noisereduction add-on accessory—on of the first Dolby-C units to hit the market. While its use with the 700ZXL does not, of course, tell us any more about the deck itself, we found it interesting to compare frequency response tracking with, and without, Dolby-C in the circuit. We did so using an expanded scale on our Sound Technology display (2 dB per division as opposed to the usual 10 dB per division). The results, shown in *Fig. 4*, indicate that inserting the Dolby-C caused no more than about 1 dB of mistracking as compared with the response obtained without Dolby-C. Do not be upset by what seem to be



Fig. 1: Nakamichi 700ZXL: Frequency response at 0 dB and – 20 dB (Nakamichi EX tape).



Fig. 2: Nakamichi 700ZXL: Frequency response at 0 dB and - 20 dB (Nakamichi SX tape).

poor response curves in *Fig.* 4—remember, the vertical scale here has been greatly expanded in order to observe minute differences between the two curves.

Figures 5, 6 and 7 depict 3rd-order distortion levels of the three tapes used in our tests as a function of recording levels. The levels increase from left to right, with "0 dB" (or 200 nWb/m) represented by the double vertical line. Note that headroom for both the EX and SX samples was between 7 and 8 dB (re: 3% 3rd-order HD), so we have listed it as +7.5 dB in the "Vital Statistics" table. The SX (metal) tape had 9 dB of headroom as shown in *Fig. 7*.

Channel separation from 20 Hz to 20 kHz is depicted



Fig. 3: Nakamichi 700ZXL: Frequency response at 0 dB and - 20 dB (Nakamichi ZX tape).

in *Fig. 8.* The cursor (invisible within the central double vertical line) is set at 1 kHz, where a separation reading of 41.5 dB was obtained, as tabulated at the lower right of the display. What is interesting about this curve is how uniform it remains over a wide range of frequencies. Even at 10 kHz, separation still reads well above 30 dB. This results directly from Nakamichi's superb tape heads, and the consistency with which correct azimuth alignment is maintained between the separate record and play heads by means of the deck's "A.B.L.E." system.

At the time we measured this unit, our test setup had not yet been equipped with its spectrum analysis feature. So we used our older general purpose spectrum analyzer to compare noise-plots for no Dolby, Dolby-B and Dolby-C in conjunction with the 700ZXL. If one needed proof that Dolby-C cuts out more noise, and works down to a lower audio frequency, simply compare the middle curve of *Figure 9* (Dolby-B) with the lower curve of *Fig. 9* (Dolby-C).

General Info: Dimensions are 19 11/16 inches wide; 10 5/16 inches high; 9 27/32 inches deep. Weight is 30 lbs., 14 oz. Price: \$3000.

Individual Comment by L.F.: If you're a regular reader of *MR&M* all you have to do to find out how I feel about the Nakamichi 700ZXL is to pick up the June 1981 issue in which NE and I reported on its "big brother," the model 1000ZXL. The introduction of the 700ZXL should come as no surprise to those who have followed the history of Nakamichi—that producer of the world's most magnificent cassette decks. After Nakamichi introduced its famous model 1000 in the early 1970s, it followed that achievement with a model 700 which did many of the fine things that the 1000 had done. Best of all, the 700 sold for about \$700 as compared to the original price of the 1000 which was a bit over \$1000.

Would that the new 700ZXL were again priced at



Fig. 4: Nakamichi 700ZXL: Response at -20 dB, using EX tape without Dolby C (upper trace) and with Dolby C.



Fig. 5: Nakamichi 700ZXL: Third-order distortion vs. record level, using EX tape.

around 70 percent of the 1000ZXL. Unfortunately for many of us, that is not the case this time. The 700ZXL carries a suggested price which is only \$800 less than the \$3800 cost of the 1000ZXL. On the plus side, one gives up very few of the features of the larger model in selecting the 700ZXL and again, in my view, the 700ZXL is actually a more handsome looking unit. It does lack the ability to automatically identify generic tape types during the "A.B.L.E." process, but even the laziest of recordists should not object to having to flip a couple of switches for this function. A more serious "missing feature" (again, referring only to the bigger 1000ZXL for comparison) is the control that permitted us to disagree with what the microprocessor judged to be the optimum bias for a given tape; with that control absent, we will have to accept "flat frequency response" as the number-one criterion whether we like it or not. The "A.B.L.E."



Fig. 6: Nakamichi 700ZXL: Third-order distortion vs. record level, using SX tape.





system really goes after that, as our test results show.

As a recordist of long musical selections, leaning towards the classics and good long jazz presentations, I am less intrigued by the RAMM system than would be the lovers of rock and pop who juxtapose many short selections on a single cassette side. Still, this system does work, it does what it's supposed to do quickly and efficiently, which is what you'd expect of any feature incorporated in a Nakamichi product.

I've recently learned that Nakamichi has built a "limited edition" version of its famed model 1000ZXL. It has a lot of gold-plated parts and lot of close-tolerance parts inside. The going price for this version is, I am told, a staggering \$6000. Faced with that kind of price, the model 700ZXL is—as they say—a real bargain!

Individual Comment by N.E.: The Nakamichi 1000ZXL and its "kid brother" the 700ZXL may be the world's best pair of siblings in the cassette recorder field, but "best" here actually means only a little better than many other decks costing one-third or so as much. Without a doubt, Nakamichi helped change the whole course of cassette machine development when it showed its model 1000 back in 1973, and I have said so many times in print and in conversation. But how much farther can this format be pushed? There are many who say that the cassette format, by definition, has built-in limitations, and that even when things look great "on paper" they do not necessarily translate in practical or effective terms into better sounding results.

Even if they did, that big leap in cost—from the about \$1000 level to the \$3000-and-up level—seems hard to justify except possibly for the most finicky and wellheeled devotee of the format. I am not arguing against the obvious technical excellence of the 700ZXL or the 1000ZXL. What I do question is whether or not this kind of product represents an order of technology that is overdeveloped beyond what is called for, and possibly



Fig. 8: Nakamichi 700ZXL: Channel separation vs. frequency.

too beyond what people can afford to pay for it.

If you can satisfy yourself that response on a cassette to 25 kHz is really an improvement over response to only 20 kHz or so, by all means go out and enjoy yourself. If you want a system to automatically find selections on a cassette, you can have it. If automatic calibration adjustments seem to you better than manual adjustments, fine—there they are. But these embellishments come at a premium price, and the question of the point of diminishing returns for no return) does seem to come up.

Incidentally, on the Dolby-C and its improvement of S/N to better than 70 dB—in our November 1981 issue we reported on the Yamaha K-960 with built-in dbx which lifted S/N to better than 85 dB. This is not a comment on the relative quality or performance of the two decks, but it does seem to say something interesting about noise-reduction.



Fig. 9: Nakamichi 700ZXL: Spectrum analysis of tape noise. Upper curve taken with no noise reduction; middle curve with Dolby B; lower curve with Dolby C.

NAKAMICHI 700ZXL CASSETTE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	
Frequency response, standard tape	± 3 dB, 18 Hz to 24 kHz	± 3 dB, less than 20 Hz to 26 kHz
high-bias tape	± 3 dB, 18 Hz to 24 kHz	± 3 dB, less than 20 Hz to 25.5 kHz
metal tape	± 3 dB, 18 Hz to 24 kHz	± 3 dB, less than 20 Hz to 26 kHz
Wow-and-flutter (WRMS)	0.04%	0.033%
Speed accuacy	NA	+ 0.36% (adj.)
S/N Ratio, Dolby off		
(re: 3% THD record level)		
	NA	55.7 dB
standard tape	NA	59.2 dB
high bias tape	NA	59.5 dB
metal tape	10	
Same, Dolby-B on	NA	65.2 dB
standard tape	NA	67.7 dB
high-bias tape	66 dB	68.4 dB
metal tape	66 UB	
Same, external Dolby-C added	N 6	70.5 dB
standard tape	NA	10.0 00
high-bias tape NA	72.5 dB	74.3 dB
metal tape	NA	74.5 60
Record level for 3% THD		
(0 dB = 200 nWb/m)		+ 7.5 dB
standard tape	NA	+ 7.5 dB
high-bias tape	NA	+ 9.0 dB
metal tape	NA	4 9.0 db
3rd-order distortion at 0 dB record leve		0.45%
standard tape	1.0 (THD)	0.32%
high bias tape	1.0 (THD)	0.39%
metal tape	0.8 (THD)	
Line output at 0 dB	1000 mV	930 mV
Headphone output at 0 dB	45 mW	45 mV
Mic input sensitivity for 0 dB	0.2 mV	0.2 mV
Line input sensitivity for 0 dB	50 mV	48 mV
Fast-wind time, C-60	NA	50 seconds
Bias frequency	105 kHz	Confirmed
Power consumption	65 watts	45 watts
	CIDCLE 22 ON READER SERVICE CARD	

CIRCLE 23 ON READER SERVICE CARD

Soundcraftsmen AS1000 Auto-Scan-Alyzer

General Description: The AS1000 by Soundcraftsmen is a real-time spectrum analyzer that embodies, in addition to the direct-measurement spectrum LED display technique, a new technique known as the "differential/comparator" (on which patent is pending). By the new method, pink noise (generated within the AS1000) is fed to one side of the comparator and to an external equalizer at the same time. The equalizerprocessed pink noise, amplified and reproduced through the sound system, is picked up via a calibrated microphone (not supplied) and applied back to the other side of the AS1000. By means of controls and associated indicators on the AS1000, it then is possible to analyze the signal and perform required equalization adjustments.

This method is credited with eliminating imperfections and anomalies that exist in conventional methods of analyzing and equalizing. The manufacturer claims for this method an accuracy of 0.1 dB, as opposed to errors of 1 to 4 dB common to other EQ methods. While cosmetically matching Soundcraftsmen's model TG2245 equalizer (test-reported in MR&M, May 1981), the AS1000 is compatible and may be used with any other octave equalizer. It may be interconnected in a number of ways—at line level, between separate preamp and power amp, or into a tape-monitor or effects or processor loop. The equalizer used with it may be interfaced via front- or rear-panel jacks.

The front panel contains a 10-column LED display, with each column containing ten LEDs. The vertical columns are on frequencies of 30, 60, 120, 240, 480, 960, 3840, 7860 and 15360 Hz. The horizontal calibration runs from 0 dB (the bottom-most LEDs) to 18 dB (the uppermost row) in steps of 2 dB. Two additional LEDs serve as balance indicators for the differential/comparator system. A row of push buttons control selection of mic/line; pink noise/source; analyze/display functions; channel A or B (or their sum); auto or manual scan mode; and a hold option for the manual scan. Three knob adjustments are supplied for calibrating the scanalyzer input; the pink noise level; and the scanning rate in automatic mode. At the far right of the panel are ¹/₄-inch phone jacks (mono) for microphone input and high-level input; and two jacks (stereo) for patching into and out of an external stereo equalizer. The device's power off/on switch is at the far left. The panel extends at the sides for standard rack-mounting, or the device can be fitted with optional rosewood side panels for

other installation.

At the rear are line in and out jacks for each stereo channel. There is a set of jacks for ¼-inch phone plugs, and a duplicate set for hi-fi pin plugs. Also on the rear are block diagrams showing a typical pro hookup and a typical hi-fi system hookup using the AS1000. The unit's power cord is fitted with a three-prong (grounding) plug.

Test Results: This sort of equipment does not lend itself to presentation of our usual "Vital Statistics" table, so we are simply reproducing in its place Soundcraftsmen's general published specifications for the AS1000.

The block diagram should aid in understanding the differential/comparator principle. In effect, the scanalyzer compares the original internal test signal (a oneoctave band of pink noise) with the same signal as picked up by the calibrated microphone and amplified by its own internal circuitry as well as by whatever equalizer is patched into the system. Only when the equivalent rectified DC voltages derived from these two inputs are



Fig. 1: Soundcraftsmen AS1000: Manufacturer's block diagram showing signal path and method of analyzing with new patent-pending scan-alyzer differential-comparator circuitry.



Fig. 2: Soundcraftsmen AS1000: Broadband pinknoise signal produced by AS1000 has usual 3 dB/octave slope.



Fig. 3: Soundcraftsmen AS1000: Noise signal produced by unit for 1 kHz-octave analysis.

within 0.1 dB of each other will the two comparator LEDs become uniformly illuminated. When attempting to equalize a system for "flat" response, since only one octave at a time is dealt with (and can be precisely adjusted to match the comparator level desired), the process is completed fairly quickly, and without a lot of trial and error common to other methods of graphic equalization.

Figure 2 shows a spectrum analysis of the wide-band pink noise signal produced by the AS1000. In Figure 3 we have plotted the one-octave noise signal centered around 1 kHz which appears at the noise-output terminal when octave-by-octave analysis and adjustment are being done with the analyzer.

General Info: Dimensions are 19 inches wide; 3½ inches high; 11 inches deep. Weight is 18 pounds. Price: \$499.00.

Joint Comment by N.E. and L.F.: Whereas most real-time analyzers, when used with octave or third-octave graphic equalizers, are usually limited in their accuracy to anywhere from 1 dB to 4 dB of error, the AS1000 actually can maintain accuracy to within 0.1 dB (excluding, of course, the microphone used which must have its own known calibration curve). If 0.1 dB sounds as though it's almost too accurate, we can only say that a tolerance of 0.1 dB is obviously preferred to 1 or 4 dB whether the task is room equalization, sound-reinforcement, system analysis or whatever.

We are told that the AS1000 was designed originally to be part of Soundcraftsmen's professional line, but that a great many units are being ordered by hi-fi dealers. We can understand why, and it probably is a combination of the audiophile's quest for pin-point accuracy plus the LED display and the assorted controls on the front panel. Whatever, we suspect that the user (neophyte or professional) will soon discover that the AS1000 is anything but an "audio toy." It can be used for a wide range of applications, from establishing EQ curves for different conditions within the listening environment (crowded or empty; draped or undraped rooms; etc.) to establishing the performance characteristics of a given component insofar as its effect on overall response is concerned. The price of the AS1000 seems quite fair for the kind of precise soundsystem response calibration it can provide.

SOUNDCRAFTSMEN AS-1000 AUTO-SCAN-ALYZER Published Specifications

DIFFERENTIAL COMPARATOR:

Minimum Input: 75 millivolts Differential measurement accuracy: ± 0.1 dB

HI LEVEL INPUT:

Input impedance: 47 K ohms Gain: adjustable: 30 dB max. Freq. Response: ±0.1 dB 20 Hz to 20 kHz

- MIC PREAMP: Input impedance: 2000 ohms Gain: 80 dB max Freq. Response: ±0.1 dB 20 Hz to 20 kHz
- PINK NOISE SOURCE: Internal generator

BAND-PASS FILTERS: Standard ISO Center Frequencies: 30, 60, 120, 240, 480, 960 Hz 1.92, 3.84, 7.68, 15.36 kHz

SELECTABILITY:

Manual or Auto-Scanning with adjustable scan rate Electronic switching of display and analyzer filters

CIRCLE 24 ON READER SERVICE CARD

Denon DH-510 Open Reel Recorder



General Description: The Denon DH-510 is an open-reel half-track tape deck. It handles 7-inch and $10\frac{1}{2}$ -inch diameter reels, and it operates at tape speeds of 15 and $7\frac{1}{2}$ inches-per-second. The three heads (erase, record, play) are electrically and physically separate. The logic-controlled transport can be fast-buttoned. Provision is made for bias and equalization adjustments, and for mixing of the mic and line inputs while recording. Unattended operation is possible with an external timer; this feature also can be used to supply power to external equipment at a pre-set time.

Included in the transport functions are pause and mute as well as a cueing option, the latter requiring that you carefully move the pinch roller closer to the capstan during fast-forward or rewind. Metering can be switched to show peak and VU levels. For stereo recording, both half-tracks are used. For mono recording, the two half-tracks can be used individually (exchanging and reversing the reels), or together for "full track."

Layout of the deck is fairly standard and familiar. The reel turntables, tape guides and rollers, head assembly and counter occupy the upper two-thirds of the deck. Switches for power off/on, reel size, speed, timer start and the transport buttons form a horizontal row just below. And below them are the electronic controls and meters. Included here are the tape/source monitor switch; the EQ and bias adjustments; the recording/playback selector; mic attenuator; mic input level controls; line input level controls; output level controls. Also on the front panel are the mic jacks and a stereo headphone jack. Line input and output connectors, plus a remote-control socket are at the rear. Mic and line in and out jacks are all unbalanced.

Test Results: All published specs for this professional-grade deck were met or exceeded in our lab tests. While a glance at the table of "Vital Statistics" can indicate how good this deck is, a few points might be explained to help the reader appreciate the real difference between a good open-reel tape machine and a state-of-the-art cassette deck. In Fig. 1 we show two frequency response curves taken on the Denon DH-510 using Maxell UD-XL tape. Note that the upper curve (here denoted by the "L" dB reading) was taken at 0 dB record level, which-for this machine-is at 200 nWb/m. In cassette decks we usually quote response for record levels of -20 dB, and even at that reduced level we feel lucky if response makes it "flat" to near 20 kHz. In this case, as Fig. 1 shows, response is down a mere 1.1 dB at 40 kHz for a 0-dB record level using the 15 ips speed. And if we back off to an average -10dB record level (still 10 dB higher than what is normally used for measuring cassette performance), response is flat to within 0.7 dB out to 40 kHz.

Using the slower speed of $7\frac{1}{2}$ ips (see Fig. 2), the Denon has response that extends to 33 kHz for the -10 dB level, and to higher than 20 kHz at the 0-dB reference level. See if you can manage to duplicate that on *any* cassette deck using *any* kind of tape, including metal!

What about headroom? Figures 3 and 4 show plots of 3rd-order distortion versus recording level for 15 and $7\frac{1}{2}$ ips on the Denon. The double vertical line represents "0 dB" reference level. We have moved up the cursor (vertical dotted line) 11 dB above that point to observe 3rd-order distortion levels of only 2.2 percent for either tape speed. Since that is as high as our automatic plotter goes, we have interpolated the



Fig. 1: Denon DH-510: Frequency response, 0 VU (upper trace) and -10 VU, at 15 ips.

3-percent distortion point as being 12 dB above the 0-VU reference level. It turns out, then, that at 0 dB recording level, the 3rd-order distortion at 15 ips is a mere 0.26 percent. At $7\frac{1}{2}$ ips it is even lower, measured as 0.17 percent.

(In addition to providing a single weighted or unweighted S/N figure, our Sound Technology 1500A Recorder Test Set is now equipped to analyze noise in third-octave bands. Thus we will be presenting displays of noise spectrum in addition to listing the single S/N figure.) Using CCIR/ARM weighting, we read 67.3 dB of S/N (referred to 3 percent distortion) at the 15 ips speed (*Fig. 5*), and an almost identical 68.3 dB at $7\frac{1}{2}$ ips. While we prefer the CCIR/ARM weighting curve for signal-tonoise measurements, we should point out in all fairness that Denon's published spec uses "A" weighting. When we used the "A" weighting just to see what difference it



Fig. 2: Denon DH-510: Frequency response, 0 VU (upper trace) and -10 VU, at 7¹/₂ ips.



Fig. 3: Denon DH-510: Third-order distortion vs. record level, 15 ips.

made, we came up with an even better S/N figure, 70.6 dB. Remember, all of these figures were obtained with no form of electronic noise-reduction—and with what is, after all, a ferric-oxide tape (albeit a high-quality one).

Our testing facility now enables us to plot the makeup of wow-and-flutter components in addition to arriving at a simple over-all number for this characteristic. The plots in *Figures 7* and 8 cover frequencies from 0.2 Hz to 200 Hz (double vertical lines are seen at 1 Hz, 10 Hz and 100 Hz). For the 15 ips speed, wow-and-flutter (JIS or WRMS) measures 0.023 percent, the number printed at the top of the display. Note too that the cursor has been set to read the worst wow component, which happened to occur at 3.15 Hz and which was the major contributor to the total reading.

Interestingly, when we shifted down to the slower $(7\frac{1}{2}$ ips) speed, the major wow component, as might be expected, moved down in frequency to 1.6 Hz. Now, because 1.6 is more heavily attenuated in the weighting curve used, the wow component at this frequency (as well as the overall wow figure) is slightly lower, or 0.019 percent. Had we measured wow-and-flutter without any weighting curve, the two readings would no doubt have been identical. The point of using a weighted curve in wow measurements is to provide a clearer understanding of the relation between the annoyance factor of wow and the numbers used to express it.

Mechanically, the transport ran very nicely, although breaking—in the fast-wind modes—was extremely slow. To be sure, the tape was never in danger of being damaged (thanks to the IC logic circuitry, the controls and the excellent reel motors), but our feeling is that a machine intended for mastering applications should have better controlled cueing and fast spooling.

We also found that the EQ and bias settings recommended in the manual for the tape we used did not provide precisely optimum results. We suggest therefore that the operator ought not to follow those suggestions



Fig. 4: Denon DH-510: Third-order distortion vs. record level, $7\frac{1}{2}$ ips.

blindly, but should do a little experimenting (as we had to do) to determine the true optimum settings of bias and EQ for a particular tape being used.

General Info: Dimensions are 17.9 inches wide; 18.7 inches high; 8.27 inches deep. Weight is 48.4 pounds. Price: \$1325.

Individual Comment by L,F.: I am rather pleased that we are able to publish reports about this Denon open-reel, half-track deck in the same issue in which we report on the Nakamichi 700ZXL cassette deck. Next to Nakamichi's own 1000ZXL, the 700ZXL is probably the finest cassette deck ever built, and—at a list price of \$3000—it also is one of the most expensive. Yet, this basic no-frills open-reel machine from Denon costs less than half of what the Nakamichi cassette deck costs,



Fig. 5: Denon DH-510: Signal-to-noise ratio re: maximum (+ 12 dB) record level, CCIR/ARM weighting, 15 ips.

but literally runs rings around it in *basic* recording performance.

Don't get me wrong. I love the Nakamichi unit for what it is—a brilliantly designed and executed *cassette* deck. But I am a bit tired of makers of cassette decks who keep telling us that at last they have a machine that performs as well as an open-reel deck. The two products have totally different virtues and applications and, as we have pointed out more than once in these pages, if the same engineering effort is put into open-reel deck design as has been put into cassette deck design, the open-reel machine—by virtue of its wider tape and faster speed—*must* come up the winner.

And in the case of the Denon DH-510 we are talking about a half-track (rather than a quarter-track) machine, which makes performance that much better.

This has been covered in the "Test Results" above. However, with all due respect to Denon, I feel there really is no excuse for the kind of owner's manual supplied with this not inexpensive piece of machinery. I can forgive the fact that it is simply a photo-offset printing of typewritten pages, but there is no longer any excuse for the poor and often confusing translations from the Japanese that seem to find their way into so many manuals. To brighten your day, let me offer some direct quotes from the manual:

"ERASING

The operation for erasing is same as for recording, except that the LINE IN and the MIC IN level controls must be turned to "0" For recording, since those sound recorded before is automatically erased, there is no need for erasing beforehand."

Or, how about this reassuring statement concerning the equipment guarantee:

"1. This apparatue (sic) is accompanied with a guaranteed (sic) card to guarantee the apparatus for a period of 1 year. Confirm it and read it through and retain it. If the guarantee card is not enclosed your ap-



Fig. 6: Denon DH-510: Signal-to-noise ratio re: maximum record level (+ 12 dB), CCIR/ARM weighted, 71/2 ips.



Fig. 7: Denon DH-510: Wow-and-flutter (WRMS) at 15 ips.

paratus, contact your DENON dealer your purchesed (sic) your apparatus."

Individual Comment by N.E.: The owner's manual for the Denon DH-510 is a near disaster. It is so full of awkward phrases, misspellings, and grammatical lapses, and it is so poorly illustrated that after a while you may wonder if it was intended to provide some laughs to help you get over the outlay of cash after purchasing it. Here are some gems picked at random:

"Keep a good ventilation."

"It is recommendable to use the apparatus in vertical position in case of a continuous operation."

"...flaten low frequency irregularity..."

"...can be easily sett..."

"...level margine...'

"The microphone amplifier is seldom satulated..." And so on, through "recenet years" and "Lord the



Fig. 8: Denon DH-510: Wow-and-flutter (WRMS) at 71/2 ips.

tape" to the "recording equaler curve..."

Why a company that can produce such a fine piece of recording equipment (not to mention other notable Denon audio products) allows a manual like this to go out with it remains one of the mysteries of our time. Someone might argue that the DH-510—being half-track and all that—is not intended for your typical home hi-fi enthusiast who must be coddled and led by the hand with "pretty instructions." Perhaps. But even the seasoned pro or semi-pro appreciates a manual that is well-written, grammatically lucid and amply illustrated.

Having said this, it remains to be restated that the Denon DH-510 is a real tape-recording "tool" whose format, features and performance—with its superior frequency response, signal-to-noise characteristics, headroom and so on—make it very suitable for serious production work such as mixdown and stereo mastering.

DENON DH-510 OPEN-REEL TAPE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Frequency response, 15 ips	± 3 dB, 30 Hz to 30 kHz	± 3 dB, 21 Hz to 40 kHz (0 VU)
7½ ips	± 3 dB, 20 Hz to 25 kHz	± 3 dB, 20 Hz to 32 kHz (- 10 V)
THD at 0 VU, 15 ips; 7 1/2 ips	0.5%	0.26%; 0.17% (3rd order)
Record level for 3% THD		
15 ips; 7½ ips	NA	+ 12 dB; + 12 dB (3rd order)
Best S/N ratio (std tape)	66 dB	67.3 dB; 68.3 dB (15:7 1/2)
Wow-and-flutter, 15 ips; 71/2 ips	0.025%; 0.030%	0.023%; 0.019% (WRMS)
Rewind time, 2500-ft. reel	150 seconds	82 seconds
Mic input sensitivity	0.20 mV	0.21 mV
Line input sensitivity	62 mV	60 mV
Line output level	775 mV	776 mV
Phone output level	NA	59 mV into 8 ohms
Bias frequency	180 kHz	Confirmed
Erase ratio	NA	77 dB
Speed accuracy	±0.5%	± 0.3% (7½ ips)
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POPULAR

THE POLICE: Ghost In The Machine. [The Police and Hugh Padgham, producers; no engineers listed; recorded at AIR Studios, Montserrat, except "Every Little Thing She Does Is Magic," which was recorded at Le Studio, Quebec.] A&M SP-3730.

Performance: Even better than before Recording: An arresting production

As difficult as it may have been to imagine, the Police have managed to take their wonderful style of music one step further with the release of their new LP. Ghost In The Machine. The basic foundation is the same-there's no mistaking Sting's voice, Stewart Copeland's rat-tat-tat, and Andy Summers' steely guitar strokes-but an air of intrigue streams from the speakers, as a mesh of spunk, funk, calypso, latino breezes and some classy rock'n'roll signal a refreshing new direction. While the songs as a whole grow in style, each band member also diversifies, and with Hugh Padgham joining the Police as producer, listeners can actually hear Copeland working the tom tom or snare, Summers twanging away irreverently and Sting either blowing sax or doing overdubs on his own distinctive wail.

Side One is the album's stronger side, beginning with the politically tinged "Spirits In The Material World," and followed by "Every Little Thing She Does Is Magic," cuts so enticing that the excitement bowls over into every melody. Both tunes showcase Copeland's committed beat, and the latter number is juiced up to calypso by a loosened snare and the dancing keyboards of Jean Roussel. Sting juggles vocal roles-from a loving skip in "Every Little ... " to a dreary, yet captivating mode for "Invisible Sun," a song where heavy, heavy bass fills spread like the deep core of an echoing cave. Even Summers probes new territory, especially during "Demolition Man." where he pulls and vibrates his guitar strings, all the while allowing some very effective feedback squeals. It's all so acidic, in the Sixties sense of the word.

Following suit for the Eighties, Side Two thumps with funk. Cleverly, "Too Much Information" relies on random treble jerks, rather than spunky rhythm, and the hard, double-time pace of "Rehumanize Yourself" could be the Police's version of soul music. Almost every remaining number follows this funky suit, and the album's soft closer, "Darkness," reaffirms the band's committment to exploration and growth.

It's fortunate that the Police's search has uncovered some great, new uncharted material, unlike so many bands that reach a pinnacle, then fail with change. Unfortunately, the success of *Ghost In The Machine* only makes the challenge for something better the next time a little harder. E.Z.G.

BOB DYLAN: Shot Of Love. [Chuck Plotkin and Bob Dylan, producers; Toby Scott, engineer; recorded at Clover Recorders, Hollywood, Ca., except "Shot Of Love," recorded on



THE POLICE: Uncovering some great, uncharted material.
location at Peacock Records Studios.] Columbia TC 37496.

Performance: Shot with love-Dylan at his best Recording: Unpretentious and intelligent

Bob Dylan's career has been one great roller coaster ride since the beginning. He has consistently followed low periods with high ones and vice versa. But one thing about Dylan: he has always kept changing and kept true to his own needs and whims, regardless of the desires of his fans and critics. Sometimes he has paid for those swift changes in style and perspective; other times he has been rewarded

Most recently, of course, Dylan's popularity took a dive when he embraced the Christian religion and unashamedly sang about his devotion. Dylan didn't attempt to mask his bornagain Christianity; he dove right into it. He lost a lot of his most rabid fans as a result of his move, but he stuck with his decision and made the music he was feeling. Charges of irrelevancy followed him, whereas he was once considered the greatest pop poet of our age.

Now Dylan is back with Shot Of Love, and it is easily his most enjoyable work since his Blood On The Tracks masterpiece of the mid-'70s. There are moments on this album that are positively chilling. Dylan's singing and his songwriting are something to pay attention to once more.

Although the subject of Jesus is present, it is not dominant as on past recordings. Nor is the gospel feel that didn't always sound very professional. Dylan has again constructed melodies that are easy to grasp onto; his words once again sting and meld together with remarkable fluidity. And his voice once again has its special, inexplicable charm.

There are many lyrical segments on the LP that are worth quoting, but to do so would detract from the experience of hearing the record. "Lenny Bruce," a Dylan tribute to the late comedian/social critic, for example, is positively flooring. Compared to similar past Dylan tributes such as those to "Hurricane" Carter and George Jackson, this one is a masterpiece. It will make any listener who isn't familiar with Bruce's work and life want to be.

Nearly every other song on the album has something to say lyrically and Compress/Limit/De-Ess and Noise Gate/Key/Duck Two Channels/Push Button Stereo/Independent Tracking



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something musically compelling. The arrangements are simple, Dylan uses familiar backing musicians and singers to help him bring out his music rather than drown it, and he himself sounds more sure of himself as a singer than he has in years.

Perhaps what is the most wonderful thing about Shot Of Love, however, is Dylan's voice itself. He no longer sounds as if he is trying to be something other than Bob Dylan. There are moments that bring to mind various other points in his career, from the very early folk days through his rock days, country era and the more recent, mature, gospel Dylan. Dylan sounds as if he's figured out how to incorporate his beliefs into his music rather than let them dominate it. He even sounds angry again at times, and humorous at others. Plus, he's letting his feelings about concerns other than religion affect his craft again, and it's made all the difference.

Whatever it all means, and whether Dylan or his co-producer (Chuck Plotkin) are responsible for the wealth of excellent recorded music to be found on this record, there is no denying that Dylan is still able to make music that matters. There's more here, after 25 +albums, than most artists will record in an entire career. J.T.

ART GARFUNKEL: *Scissors Cut.* [Roy Halee and Art Garfunkel, producers; Roy Halee, engineer; basic tracks recorded at Mediasound, New York, N.Y.; overdubs recorded at Wally Heider, Los Angeles, Ca.; vocals recorded at Criteria, Miami, Fl., mixed at Sound Mixers, New York, N.Y.] Columbia FC 37392.

Performance: The guy can still sing Recording: Good when Artie's not drowned by mush

Paul Simon has established such a successful solo career in the years since the split of the Simon and Garfunkel team, that one often tends to forget that it was Art Garfunkel whose voice was heard singing lead on most of the duo's best known songs. But Garfunkel has also been somewhat successful in the past 10 years, both as a singer and actor, even if he hasn't enjoyed the level of popularity his former partner has.

Scissors Cut is, for the most part, a

satisfying recording by the bushyhaired, still-youthful-looking Garfunkel. Perhaps the reason for this, though, is that so much of the material is reminiscent of the music of Simon and Garfunkel.

The album's opening track, "A Heart In New York," sounds, in fact, remarkably like something Simon might have had a hand in. Its arrangement, the double-tracked vocals, the lyrics centering on New York, and the lilting melody all smack of Simon, although the cut was written by Benny Gallagher and Graham Lyle.

Similarly, the first cut on the second side, Mike Batt's "Bright Eyes," utilizes the same kind of crashing cymbals that helped make "Bridge Over Troubled Water" a classic. And Simon himself even turns up on backing vocals on Jimmy Webb's "In Cars," a pretty ballad that sounds like it could have appeared on Simon's latest album, but curiously fades out with a line lifted straight from Dylan's "Girl From The North Country" of old.

But all of these references to Simon should not be taken as a sign that Garfunkel must rely on his past associations and glory to make currently valid music. The other cuts on this record are strictly Garfunkelian ballads, complete with lush orchestration and pompous, droning arrangements. Coproducer Roy Halee and Garfunkel have come up with a decent balance that should please the singer's fans. There are no rock songs per se on the record (although "Hang On In" does move a bit), but for easy listening pop, there are few voices that have been able to remain so vital and warm after J.T. all these years.

VARIOUS ARTISTS: Seize The Beat (Dance Ze Dance). [Various producers including Andy Hernandez, August Darnell, Ron Rogers, Material, Don Was, David Was, Jack Tann and Cristina; mastered by Ray Janos at C.R.P.] Ze/Island IL 9667.

Performance: To each his own Recording: Electronically altered

Seize The Beat is perhaps the most appropriate album title to make its way to cardboard in some time. Not only does this new Ze Records' compilation "seize the beat," but it keeps it going and going and going until the light shines back on the original trappings of disco. It is clear that a steady, consistent, never-changing rhythmic lace can keep people on their feet, but it's boring to listen to. Yeah, sure, seize the beat, build around it, and get the people moving—just like mass hypnotism.

In its defense, the compilation is a wonderful dance record for those who only need a pulse. There just ain't no way to sit through these six songs without snapping, bopping and bouncing, but to find distinct qualities within each song, well, that's a tough task. The female vocalists have the most captivating roles in this collection. Material's "Busting Out" has its rhythmic rope accented by the dynamic Nona Hendryx, who first garnered fame as Labelle's singer/ songwriter. Hendryx and Fonda Rae (who sings on the version of "Deputy Of Love" performed by Don Armando's 2nd Avenue Rumba Band) have strong, yet seductively feminine voices that sock you first, then with the same energy, ease your pain with verbal sexual delight. Cristina, on the other hand, sings the Beatles' "Drive My Car" as if she's pouting to show off her new Flaming Passion Red lipstick. Despite Dr. Buzzard's Original Savannah Band's musical performance on this tune, Cristina leaves the impression that she's a helpless woman with only tempting whispers to get her home at night.

"Wheel Me Out," by Was (Was Not) earns its distinction from the group's (which includes former MC5 guitarist Wayne Kramer and Parliament/Funkadelic percussionist Larry Fratangelo) ability to rub against the grain. The electronically controlled beat is frosted with an occasional vocal and a dry drum tap. But, when the tackling horn makes its way into the piece, the brass wind instrument steals all the attention from anything that was (not was) happening prior to the roaring.

Though Gichy Dan's "Cowboys & Gangsters" (written and produced by "Deputy Of Love's" Ron Rogers) brings more addictive throbbing, it's Andy Hernandez (also of Dr. Buzzard's et al.) in his Coati Mundi role that provides this collection's classic. The Latin rap "Que Pasa/Me No Pop I" paints all sorts of exciting multiflowing Central/South American dance scenes. The rap is so cohesive—and soft—with a raw percussion just beaming with spice, that once through the



U.S. POSTAL SERVICE STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION. (Required by 39 U.S.C. 3685.) 1. Title of Publication: MODERN RECORDING & MUSIC

- 2. Date of Filing: November 15, 1980
- 3. Frequency of Issue: Monthly
- 3A. No. of Issues Published Annually: 12
- 3B. Annual Subscription Price: \$14.00
- Location of Known Office of Publication: 14 Vanderventer Ave., Port Washington, N.Y. 11050
- Location of Headquarters or General Business Offices of the Publishers: 14 Vanderventer Ave., Port Washington, N.Y. 11050.
- Publishers: 14 Vanderventer Ave., Port Washington, N.Y. 1105U.
 6. Names and Complete Addresses of Publisher. Editor and Managing Editor: Publisher, Hector G. La Torre, 14 Vanderventer Ave., Port Washington, N.Y. 11050; Editor Hector G. La Torre, 14 Vanderventer Ave., Port Washington, N.Y. 11050, Managing Editor: Pamela Highton: 14 Vanderventer Ave., Port Washington N.Y. 11050.
- 7 Owner: Cowan Publishing Corporation, 14 Vanderventer Ave., Port Washington, N.Y. 11050.
- Washington, N.T. 11000.
 8. Known Bondholders. Mortgages. and other Security Holders Own-ing or Holding 1 Percent or More of Total Amount of Bonds, Mor-tgages, or other Securities: Richard A. Cowan, 14 Vanderventer Ave. Port Washington, N.Y. 11050, Cary L. Cowan, 14 Vanderventer Ave. Port Washington, N.Y. 11050, Amy C. Gillman, 14 Vanderventer Ave.
- 9. For Completion by Nonprofit Organizations Authorized to Mail at Special Bates: Not Applicable

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F. Copies Not Distributed 1. Office Use, left over, unaccounted, spoiled after printing	568	621
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tune leaves a hot-peppered burning in the mouth for more of the same. Unfortunately, that's not to happen here. Well, maybe on the next Ze Records' compilation. E.Z.G.



ARNETT COBB: Funky Butt, [Gus P. Statiras, producers; Fred Miller, engineer; recorded Jan. 22, 1980 at The Big Apple Studio, New York, N.Y.] Progressive 7054.

Performance: Typical Texas tenorhot, hotter, hottest Recording: Hardly definitive-but serviceable

Here's another LP of Arnett Cobb with a rhythm section going through Texas Tenor versions of Ellington ("Satin Doll"), Basie ("Jumpin' At The Woodside"), Gershwin ("I Got Rhythm") and a gorgeous ballad by Hoagy Carmichael ("Georgia On My Mind"). Thank heavens we've been spared the umpteenth version of "Flyin' Home," but then Arnett did that on a previous LP for Progressive. If Arnett is a bit predictable I think I can live with that. In some circles predictability is called dependability. Arnett very seldom hits you with any surprises. When you go to hear Arnett at a club or purchase any of his recordings you pretty well know the kind of music you can expect and he doesn't disappoint you. Yet there are little turns that you might not expect from the big Texan like the almost Ben Webster-ish way in which he gently states the melody on "Satin Doll" before he takes off and tears it to bits Texas style. Warning: "Satin Doll" is the song that brought down the house at the Hyatt Regency Hotel in Kansas City-play that cut with caution and at your own risk!

The accompanists are neither the best nor the worst Arnett has had. I've always been particularly taken with Derek Smith's piano but Ray Drummond, a new bassist to me, seems quite a bit below the usual standard of bass players Arnett has worked with in the past (e.g., George Duvivier). Ronnie Bedford swings well if not always unobtrusively but then there's that well known "Progressive" record tendency to overmic the drums anyway. Last time I mentioned this I blamed engineer Fred Miller but then Fred corrected me by pointing out that it's the A&R man who determines how the record is finally mixed down, so I guess it's Gus Statiras who likes to hear the drums cutting through the horn the way they do frequently here.

Now a word about "Funky Butt." Well "Funky Butt" has nothing to do with Texas. "Funky Butt" was one of the names given to the blues which finally emerged under the twin titles of "Buddy Bolden's Blues" or "I Thought I Heard Buddy Bolden Say." Bolden, the pioneer New Orleans jazz cornet giant who never did get to record commercially (and of whom the one rumored home recorded cylinder recording has long since been lost or destroyed) played at a rather roughhouse dance hall in New Orleans which was nicknamed "Funky Butt Hall." The words "Funky Butt" appeared repeatedly in the original song which had other racy lyrics at which the New Orleans sportin' house crowd giggled endlessly when the Bolden band performed them. The tune by the same name Arnett plays here is not the Bolden classic so I felt it was up to me to straighten out the metaphor mix before anybody suggests booking Arnett Cobb into Preservation Hall.

Arnett, superb player that he always is, never plays badly. If my preference runs to his balladry on "Georgia On My Mind" it's probably because my preference does run to that sort of tune regardless of the player. Given a rhythm section that can swing-and this one can swing regardless of who vou'd rather have in there on bass or drums-he turns in the kind of performance that keeps you waiting for the next Arnett Cobb record to come J.K. out.

ART PEPPER: Winter Moon. [Ed Michel, producer; Baker Bigsby and Wally Buck, engineers; recorded at Fantasy Studios, Berkeley, Ca.] Galaxy GXY-5140.

Performance: Piquant Recording: Handsomely balanced

I'll get the obnoxious fact out of the way so this review can proceed with all due speed: this is an album of Art Pep-

THE BIG BANDS: AKIYOSHI/TABACKIN AND CLARKE/BOLAND

By Nat Hentoff

Until now, practically all the scores for the Akiyoshi-Tabackin band have been written by Toshiko, who also plays piano and conducts. In their newest set, *Tanuki's Night Out* (JAM), however, all the originals are by tenor saxophonist Lew Tabackin although his wife, Toshiko, is responsible for the arrangements. While Tabackin is not as atmospheric a composer as Toshiko, his originals are intriguingly diversified and, at times, quite moving—as in "Yet Another Tear," a tribute to Ben Webster.

Indeed, there are two other affectionate portraits of distinctively original jazz hornmen-"Lament for Sonny" (Sonny Criss) and "A Bit Byas'd" (Don Byas). Tabackin himself has never played more personal and strongly expressive tenor than on this set, particularly in the way he sounds as well as writes his appreciation of Ben Webster, Until now. Tabackin's most singular contribution to the band was as a flutist, and his strength and resiliency on that instrument remain unimpaired on "Falling Petal." On the next album, though, more soloing by Toshiko would be welcome. She has tended to let her conducting overshadow her improvising on most of the band's albums, so it's long past time for her to write some vehicles for herself.

The rest of the band is characteristically crisp and attentive to dynamics and, when given a chance, these sidemen can shout exultanly— both as soloist and collectively. The sound quality is fullbodied and with the kind of attention to detail that indicates an engineer who can read scores.

More of a "blowing" band album is Sax No End (Pausa)—a 1967 session by the fabled multi-national orchestra co-led by drummer Kenny Clarke and pianist-arranger Francy Boland. Although the scores are fresh and deftly colored, this band's strength is in its powerful soloists—among them, trumpeter Benny Bailey, tenor saxophonists Eddie Davis and Johnny Griffin, and trombonist Ake Persson.

These huge-spirited horns burst out of the sections with roars and cries that at times makes this sound like an after-hours cutting session, but then the equally striking collective personality of the band as a whole takes over. Therefore, somewhat like the early Count Basie band, there is much more of a feeling of spontaneity throughout because even the section passages take on the fire of the soloists.

From an historical point of view, it's fascinating to hear players from so many different countries sound so *together*—in section phrasing, in time, in spirit. Also worth noting is the long undersung emotive range and technical prowess of trumpeter Benny Bailey, now back in the States and due, at last, for much more recognition than he has yet received.

The big band sound achieved in the Rhenus Studios in Cologne is among the most excitingly vibrant (without being gimmicked) I've heard. This is a set to listen to at full volume for sheer exhilaration.

TOSHIKO AKIYOSHI-LEW TABACKIN: Tanuki's Night Out. [Toshiko Akiyoshi and Lew Tabackin, producers; Ron Malo, engineer.] JAM 006.

KENNY CLARKE-FRANCY BOLAND: Sax No End. [Gigi Cami, producer; Wolfgang Hirschmann, engineer.] Pausa 7097. Noise Suppression & Power Protection



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per with strings. "Strings???!" I hear countless jazz fans cry. Yes, I knew this prospect sounds far from promising. Who can ever forget the sheer inappropriateness of the Charlie Parker With Strings albums of years ago? How can we ever sufficiently express our appreciation to Alice Coltrane for adding goopy layers of violins to her husband John's masters? The less said the better. I can count on the fingers of one hand the jazz releases of the last five decades where a string section sounds integrated with horn work. Count Art Pepper's Winter Moon among the very best.

Art Pepper has had a long and checkered career as an alto sax man. Name the greats of the post-Bebop era-Miles, Warne Marsh, Carl Perkins-Pepper has played heroically and inventively with them all. The checkered aspect of his career involved drugs, illness, the slammer. None of which helped his music throughout the Sixties. I assume that Art Pepper is a far happier soul today than he has ever been. His alto on *Winter Moon* certainly suggests that state.

Take the title cut. Pepper transforms the old Hoagy Carmichael standard into a bittersweet reverie. He receives superb backup from piano master Stanley Cowell and bassist Cecil McBee. The strings create an elegant backdrop for Pepper's provocative solo work without ever smothering his sound. "When The Sun Comes Out" has Pepper pushing himself to new heights of lyrical force. He can even bring a tear to my eyes when mining a trite Hollywood melody like the "Love Theme from Eyes of Laura Mars." I imagine Pepper is capable of turning a toothpaste TV jingle into a heartbreaking ballad. Be aware however that there are two cuts of questionable quality. The strings seem an intrusive presence on "That's Love" and "Blues in the Night." The blues feeling of both cuts seems at war with the wispy romantic string orchestra tones. But even these cuts feature flawless musicianship by Pepper and his crew. Listen to the stunning guitar solo by Howard Roberts on "Blues in the Night." It's quite easy to simply tune out the strings when faced with so charming a performance.

Ed Michel's production is intelligent and perceptive. It takes a fine ear (and hand) behind the controls in the studio to balance the needs of an eleven piece string orchestra with the needs of a five piece jazz band. Michel's production is a triumph. McBee's singing bass (and what a full-bodied and rounded tone that man gets from his instrument) is never lost in the mix. Carl Burnett's drums are high in the mix and crisply captured. Five stars for everyone on the production line.

And an embrace for Art Pepper. Another chapter in the life of a jazz phoenix. Another body rising out of the flames to sing. N.W.



ISAAC STERN: *The Classical Melodies of Japan.* [No recording credits given.] CBS 35872.

VARIOUS ARTISTS: Phases of the Moon: Traditional Chinese Music. [Recordings produced by the China Record Company for CBS Masterworks; Earl Price, album concept and direction; no engineer listed; recorded in China, circa 1980.] CBS 36705.

Performances: Oriental masterpiece Recordings: Natural in China, very American in Japan

In approaching the ancient melodies of China and Japan the first thing that the listener notices is how much more Western influence one hears in the music of Japan than one hears in the music of China. The same holds true of recording techniques. The typical layered-on sound that one hears on many recordings emanating from the U.S.A. these days is present on Columbia's Classic Melodies of Japan, but when one considers other products we've heard from the CBS/Sony combine (I'm thinking particularly of a Bill Evans Trio Live In Tokyo album of a decade or so ago) it is no surprise that the Japanese sound is close to the U.S. sound.

To dispense with the classic melodies of Japan first, here we have Isaac Stern, Russian-born, American-bred concert violinist, making music with Hozan Yamamoto, an artist on the shakuhachi notched bamboo flute of Japan, with the Ensemble Nipponia arranged and conducted by Masaaki Hayakawa, Bondali Fuju and Takatoshi Naitoh. This in-

formation and a brief description of the shakuhachi and a color photo of Isaac Stern are all the information you'll find on the back album cover. The rest is devoted to blurbs for Stern's other recordings on CBS Masterworks. I wish they'd given us dates, places and names but they didn't. Frankly, with its western influences I find the music of Japan less interesting than the music of China, at least in this recording. It also may be that certain adjustments had to be made to suit the traditional Japanese music to the violin of Isaac Stern but until I'm presented with aural evidence to the contrary I cannot find very much in the way of buried treasure in Japanese music.

The other side of the coin, or of the record in this case, is the music of China. This LP was produced in a different way. Traditional Chinese music, either in the original or arranged by various composers, was taken in recordings made in China for domestic release and put on an LP over here under the watchful eye (and ears) of Earl Price. Chinese music, on its own terms, owes little to Western culture. That some of it occasionally appears in orchestrated form for Western instruments is a fact after the fact. One such composition here, in fact, was originally composed to be played by Western symphony orchestra and later rearranged for traditional Chinese instruments. This, by the way, is not annotated in the album but came out in a recent interview which Robert Sherman of WQXR had with composer Mao Yuan. The piece, "Dance of the Yao People," which I have heard both in the symphonic version on WQXR and the traditional version presented here works equally well in each setting. Differently, not better or worse, but two different valid settings of the same music.

In the album notes Earl Price points out that two of the compositions are monophonically recorded and judiciously rechannelled for stereo. He could not bear to leave them out. I must agree with his decision especially as concerns "Spring on The Pamir Plateau," a rare gem of beauty. Also included in the liner notes are comments on the music, the circumstances behind the cooperative effort between CBS and the China Record Company and, most important of all, a description of the native instruments of China which are used in the recording.

One can easily hear and chart the in-

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fluences which the music of China had on Western culture, particularly the later operas of Puccini and much of Gustav Mahler's music. There are elements in the Peking Opera Melody, "Flowing Water" and other selections which suggest how strong the Chinese influence on Mahler's music was. *Phases Of The Moon* is a particularly important recorded document for what is can teach us of the music and the people of China...as well as for the listening pleasure to be derived. J.K.

MAHLER: Symphony No. 10. The Philadelphia Orchestra, James Levine, cond. [Jay David Saks, producer; Paul Goodman, Jules Blumenthal, Sydney Davis and Don Morrison, engineers; recorded at the Scottish Rite Cathedral, Philadelphia, Penn., April 3, 1978 and January 9 and 12, 1980.] RCA CTC-2 3726.

Performance: Levine's Mahler continued Recording: 3/4 digital, 1/4 analog

SIBELIUS: Concerto in D Minor for Violin and Orchestra; SAINT-SAENS: Introduction and Rondo Capriccioso. Dylana Jenson, violin, The Philadelphia Symphony Orchestra, Eugene Ormandy, cond. [Jay David Saks, producer; Paul Goodman, engineer; recorded at the Scottish Rite Cathedral, Philadelphia, Penn., December 12, 1980.] RCA ATCI-3972.

Performance: A new standard Recording: The best yet

THE CANADIAN BRASS: The Village Band (A Nostalgic Recollection). [Jay David Saks, producer; Paul Goodman and Sydney Davis, engineers; recorded at the Cathedral of the Madelaine, Salt Lake City, Utah, June 1980.] RCA ATCI-3924.

Performance: Typical Canadian Brass high jinks Recording: The best yet

So RCA is in the digital business for sure with this new release. There had been RCA digitals before, most notably the stunning recording of Bartok's *Concerto for Orchestra* by Ormandy and the Philadelphia Orchestra which is over a year old by now. Yet this release is something different.

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First of all, the pressings are done in Germany by Teldec and that means a high standard of excellence right there. Then there's a new packaging with an outer protective sleeve which goes over the album cover which goes over the inner jacket on which the notes are printed which goes over the sleeve which goes over the record offering maximum protection. I'm not trying to be cute about it. It really does make a most attractive way to package a product. Now that that's done with...how about the record inside the package? At its best, RCA digital-like all digital-offers expanded range and extremely quiet surfaces. Its best is surely the album by Canadian Brass recalling the kind of fare we used to hear at Village Band Concerts back when I was a kid. Chestnuts like the "Poet and Peasant Overture" nestle in close proximity to medleys of tunes by Stephen Foster and hits from the Civil War days. There are operatic arias orchestrated for band and there are brass showpieces like "Carnival Of Venice" and "Flight of the Bumblebee." It almost evokes the real thing except that five brass players do not a Village Band make. In my village there were at least a dozen, and I came from a pretty small village at that. Yet the repertoire is there and so accurately preserved in arrangements for two trumpets, french horn, trombone and tuba. If you want to know what I really miss in this recording, it's more visual than audio. I miss the red and gold uniforms, the flags, the lemonade and the mischief us kids used to get into at these band concerts in the park. The sound is not to be believed. The music jumps out at you distortion free and the Canadian Brass is there in your living room. I predict this album will be the new show-off piece for those with equipment that they want to test out and brag about, maybe even annoy their neighbors with by playing at top volume.

The recording by Dylana Jenson and Eugene Ormandy and the Philadelphia is also a milestone of sorts. As I have always reserved when discussing recordings of the Sibelius *Concerto*, the definitive version is the recording made years ago by Jascha Heifetz with the orchestra conducted by Sir Thomas Beecham. The thing about definitive versions is that sooner or later somebody comes along and redefines the concerto, in different terms to be sure, but with every bit as much validity. Invariably that artist takes a new tack, one that was overlooked by their predecessor. This is the case with Dylana Jenson who plays with a warmth and personality which one never found in Heifetz' playing because warmth and personality was not Heifetz's stock in trade. Heifetz was a virtuoso technician. Not that there's anything wrong with Jenson's technique but the important facet in Jenson's playing is her romantic interpretation of what is, basically, a violin concerto of the Romantic era, perhaps the last such concerto to be composed before romanticism gave way to neoclassicism and avant-garde-ism. As far as the sound is concerned, it's not quite the masterpiece of the recording arts and sciences that the Canadian Brass was, but dealing with a soloist and a full symphony orchestra requires somewhat more trial and error before RCA can be expected to come up with the kind of sound that they achieved on the Canadian Brass disc.

Now we get to Mahler's Tenth. Well Mahler is Mahler and Levine is Levine and Levine is doing all of Mahler and if you like Levine's dramatic way with Mahler, you'll like this. I like it about as well as I have any Mahler I've heard since the demise of Bruno Walter, but then Mahler was never one of my fave raves. The sound is interesting in that the first movement was recorded as an analog recording in 1978. Levine liked it well enough that he didn't want to junk it when the rest of the work was to be recorded digitally. RCA has done well at matching the analog and digital sound and this should cause no discomfort to anyone who buys the recording. To be sure, there are some spectacular effects in the fourth movement that cause some digital fireworks but in the first movement the sound is plenty good enough to get by and what's more important, the difference in sound is not so earth shaking that when you get to side two of the album you shake your head and wonder what just happened to your equipment. One objection that I do have is that RCA, dealing with an album that has four sides, has coupled them side one and two, and side three and four. I know most audiophiles don't use record changers but when convenience is a factor, like if you want to listen to Mahler's Tenth while you're fixing dinner, automatic sequencing would be a decided J.K. plus.



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The Otari MX–5050B

There's a very simple, straightforward reason the MX-5050B has become the world's best-selling professional tape recorder: value. If you were to janore all of the production features, dismiss the six year track record for unsurpassed reliability, you would still discover that the "B" is the best performing machine for your money. When you shop around you'll find out that it's easy to spend a little less or a lot more, but very difficult to justify to yourself that you are getting more. When you compare other machines, spec' by spec', you'll begin to see why there's more value in putting your money into an Otari. Spec's of course, don't tell the whole story. But, it's a damn good place to start your serious comparisons.

To experience the full potential, and thus the value of any product you purposely put it to the test. After a few hours in the studio or on location, you can become painfully aware of the differences between a professional machine and those with a Hi-Fi heritage. Because Otarl's only business is to serve the dedicated audio professional, you won't find cosmetic facelifts every couple of years; or, dredged-up product from another era that's labeled "Pro." At Otari we improve each product by subtle engineering refinements that make the basic product that much better without fanfare and expensive model changes that you end up paying for. And the "B" is the embodiment of this philosophy. It's been around for three years (5050 Series, 6 years) and we plan you'll keep it around a lot longer. If you're a knowledgeable audio person who already owns an Otari you'll know what we're talking about. If you're not, then it is well worth your time to review the Performance and Feature facts we've

detailed in this ad. If you're in the market for a fully professional, superreliable two-track, the time you spend to acquaint yourself with the "B" just might mean the difference between spending your money on a machine that will do for now — or deciding to make the investment in a basic creative tool that will pay you back handsomely in the years to come.



THE FACTS: PERFORMANCE.

- Overall Signal-to-Noise: 66 dB unweighted @ 520 nWb/m, 30 Hz to 18kHz.
- Dynamic Range: 72 dB unweighted: 30 Hz to 18 kHz.
- Headroom: +24 dB. Maximum output: +28 dBm.
- Overall Frequency Response: 30 Hz to 22 kHz ±2.0 dB (15 ips @ +4 dBm).
- Playback Frequency Response: 31.5 Hz to 20 kHz ±2.0 dB (15 ips @ +4 dBm).
- Distortion: less than 0.7%, 1 kHz @ 250 nWb/m.
- Crosstalk: greater than 55 dB, 1 kHz, adjacent tracks.
- Wow and Flutter: less than 0.05% (15 ips).
- Rewind Time: 90 seconds for 2500 feet.

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THE FACTS: FEATURES.

Three switchable speed pairs: 15/71/2 or 71/2/33/4 ips (automatic equalization). NAB/IEC selectable equalization. Selectable +4 or -10 dBm output. D.C. servo capstan motor with $\pm 7\%$ varispeed control. Selective reproduce for overdubbing. Four heads: 1/2 track erase, record, reproduce, 1/4 track reproduce plug-in assembly. Noise-free punch-in/outs; transport remote (optional). Built-In test oscillator. Front panel adjustable bias and equalization. Choice of three alignment levels: 185, 250 & 320 nWb/m. Dump edit and tape lifter defeat; precision aligned; and indexed splicing block. Zero memory return. 101/2" reel capacity; XLR connectors. Large, illuminated V.U. meters with adjustable peak-reading L.E.D. indicators. Independent Mic/Line mixing (20 dB pad). THE FACTS: PRICE. \$2,295.00 Suggested Professional Net. Your nearest Otarl qualified profes-

sional audio dealer has The New Workhorse in stock. Check-out for yourself why you should place your money on the MX-5050B. If your dealer shows you anything but an Otari, tell him, "No thanks, I'm only interested in making a sound investment."

Call us for the name of your nearest dealer.



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