

OCT/NOV-1976

VOL. 2 NO. 1
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MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

A Session with Judy Collins

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P.A. Primer, Part 3

Home Video Recording

— Here At Last?

Lab Reports • New Products • Record Reviews

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**Infinity announces
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The Infinity DSP Switching Amplifier™ It makes all previous amplifier technologies obsolete.

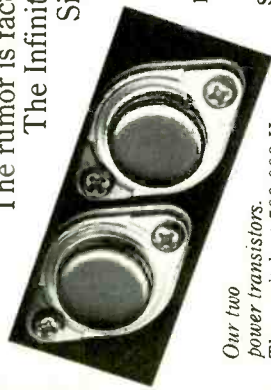
For some years now, the audio world has heard rumors of the advanced work in Class D amplification going on at Infinity, a young, and, if we do say so ourselves, rather imaginative group in Canoga Park, California. These rumors told of a major new audio technology based upon mathematic and electronic principles in use only in exotic aerospace applications. The rumor is fact.

The Infinity DSP (Digital Signal Processing)

Switching Amplifier™ has nothing in common with existing amplifiers. The sophistication of its computer technology and the unprecedented, lifelike purity of its sound are totally new. In performance, it eclipses anything ever seen—or heard—in the audio world. Including vacuum tubes and the Vertical FET which have produced the finest sound available—until now.

All amplifiers to date, whether vacuum tube or transistor (including the evolutionary V-FET), have used their device for amplification. The DSP Switching Amplifier however, employs a truly revolutionary mode of operation; it uses the transistor not for amplification, but as a *switch*. It simply switches the signal on and off 500,000 times per second—or, at the rate of two millionths of a second.

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How it works:

a not-so-simple explanation

Considerably understated, the Infinity DSP switching circuitry works like this: The power supply delivers 750 watts of regulated power by converting the 60 cycle line to DC, then to a regulated voltage level DC, and then square-wave-modulating that voltage, by switching at 25kHz. (These are the first switching elements in our circuitry.)

The amp section converts the audio analogue signal to a computer-coded pulse-width modulation and a filtering network then decodes the modulation from the switched audio signal.

The entire function is controlled by an exotic 2½" by 2½" digital chip "brain center"—the Ulrick-Henderson

DSP Hybrid™—a plug-in module containing the logic which processes the signal and controls performance functions; in effect, connecting the power supply directly to the speakers.

Nifty.

But what does it do?

It does what all previous types of amplification have tried to do and failed. It brings you the ambient, warm, life-quality of live music in a way that makes it virtually indistinguishable from the original sound.

It produces a transient-perfect signal that is literally incapable of overshooting or

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It totally eliminates the thermal degradation that plagues all transistors, vacuum tubes and V-FETs; therefore it can run virtually forever at full music power and still remain cool. It delivers a rock-steady 250 RMS watts continuous per channel, with power bandwidth from 20Hz to 20kHz, and harmonic distortion of less than 0.1%; under any line conditions from 96 to 240 volts, anywhere in the world. With no degradation power in output, quality or performance.

Yet it measures only 18¼ by 4½ by 12 inches and weighs less than 40 pounds!

There has never been an amplifier even remotely resembling the Infinity DSP Switching Amplifier—in breadth of tonal quality, or in depth of technological advances.

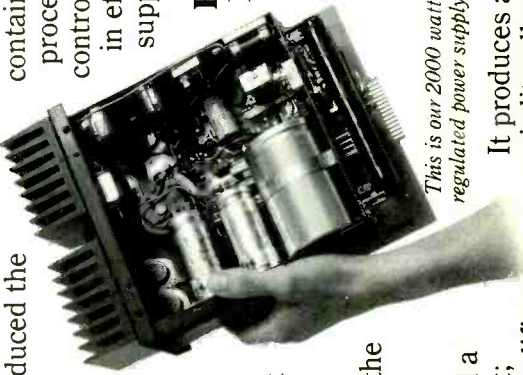
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The DSP Switching Amplifier is ready for you at selected Infinity dealers.

Are you ready for the Third Era?



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This is our 2000 watt regulated power supply.

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MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

OCT/NOV 1976

VOL. 2 NO. 1

THE FEATURES

HOME VIDEO RECORDING —HERE AT LAST?

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By Robert Angus

Experts have said for years that home video recordings—whether on tape or disc—are inevitable. Our author discusses the various systems, how they work, how much they cost, and some of the problems that must be solved before this new medium can become a reality.

A SESSION WITH JUDY COLLINS

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By Veda Neu Solomon

A look beyond the famous blue eyes into the recording studio world of a demanding perfectionist. Her latest album, *Bread & Roses*, has been hailed especially for its production and arrangements, and MR provides a glimpse of the people and work involved.

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By Jim Ford and Brian A. Roth

The concluding installment of MR's three-part guide to sound reinforcement. The authors discuss the main and stage monitor speaker systems, mics and technique, wiring and power distribution.

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By Jim Ford and Brian A. Roth

An addendum to the P.A. Primer, in which young engineer Mike Plugg founds Hornblower Sound, Ltd., contracts for his first gig, and discovers several unforeseen problems.

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Letters to the Editor

Neve Responds to Gus Dudgeon

Your article on Gus Dudgeon, Elton John's producer, in the June/July issue was most interesting to read. Elton John is a great star, and Gus is a great producer.

At first, I was very disturbed about the comments Gus made about Neve, particularly the equalization. As I considered what steps should be taken to rebut Gus' statement, I got to realize these were subjective preferences, and for every top producer that does not like Neve, we have half a dozen that do! Now, why would world-leading studios in New York, Nashville, Los Angeles, London, Paris, Toronto and Montreal continue to use and buy Neve consoles? Because producers and engineers like the sound they get out of Neve consoles, more than any other. As to the EQ, no other console manufacturer makes available six different equalizer modules to select from. The particular statement by Gus that the EQ is so sharp is partly correct. On our model 1081 (the most extensive EQ available in any console) you can make it sharp, or you can make it broad, because it is semi-parametric. Obviously, to attempt to duck out multi-track Neve EQ with some other EQ would not be possible, because the other EQ does not have the flexibility, frequency selection or the cut/boost excursion of the Neve.

I have to agree with Gus when he says it is "a pretty bloody stupid reason to buy anything" because it's British. And I would insult all of my customers if I didn't agree. Believe me, there is no "Buy British Act" in the U.S., Canada nor in France. Studios buy Neve consoles because they are the best!

I hope Gus will talk to us about his upcoming console requirement. We have so many new products to show him.

—Tore Nordahl
General Manager
Rupert Neve Incorporated

Prime Primers

Hats off and a deep bow to Jim Ford and Brian Roth, for the both of them are "prime" primers! Their writing style and intense explanations are crystal clear. It is what a vast majority of beginning soundmen need to know before the mixing procedure begins. Waiting for the real-life or "live" sound-system article.

—Mark Brown
Juno, Fla.

Thoughts on Kazdin Interview

Herewith, a few thoughts provoked by your engaging interview with producer Andrew Kazdin in the April/May issue. Certainly, mics positioned at some seat in the audience will pick up a sound which, played back over loudspeakers, may seem too distant. (Some mention could have been made of the binaural system—headphones only—which offers an unequalled sense of realism from any location.) Those famous Mercury "Living Presence" discs were recorded with mics near the front of the orchestra, but they still intentionally capture a *sense of place*, the sound of that particular concert hall; for this reason only omnidirectional mics were used. Kazdin rightly notes the importance of visual cues to our perception of "live" music per-

Continued on p. 6

JVC builds in what other receivers leave out. A graphic equalizer.



The only way you can equal the realistic sound capability of JVC's modestly priced S300 stereo receiver, is by adding an expensive, but highly versatile graphic equalizer, to another receiver.

For the price of a conventional receiver in its price range, the S300 has built-in JVC's exclusive graphic equalizer system. With five zone controls to cover the entire musical range. While most high priced receivers offer bass and treble controls, and some include a third for midrange, none approach the precision and flexibility of the SEA graphic equalizer system developed and patented by JVC.

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By adjusting the five detent tone controls covering the frequency range at 40Hz, 250Hz, 1,000Hz, 5,000Hz and 15,000Hz, you can create 371,293 different sounds. A feat never before achieved (with a stereo receiver) outside a professional recording studio. But, then, the S300 is a JVC professional.

Get better performance from your components and listening room.

Why do you need such tremendous variations in tone? Quite simply, they help you to overcome the shortcomings of the acoustics in your listening room; they also can help you to compensate for the deficiencies in old or poor recordings.

Finally, they can do wonders for the frequency response of your speakers, and where you place them.

SEA is really quite easy to use. For example, the 40Hz switch reduces record hum or rumble, and it can add greater clarity to the ultra low bass of an organ.

The problem of booming speakers is simply handled with the 250Hz switch. And in the important midranges, the 1,000Hz control adds new dimension to the vocals of your favorite rock performers, while the 5,000Hz switch brings out the best in Jascha Heifetz. You can even reduce tape hiss and diminish the harsh sound of a phono cartridge at high frequencies, with the 15,000Hz control. Then, to double check any adjustment, SEA works with a tone cancellation switch which permits you to instantly compare your setting with a perfectly flat response.

SEA adjusts the sound of your system to the size of your room.

You see, small rooms tend to emphasize high frequencies, while large ones accentuate the lows. But the ingenious SEA allows you to compensate for room size

and furnishings—so your system can perform the way it was meant to, wherever you are.

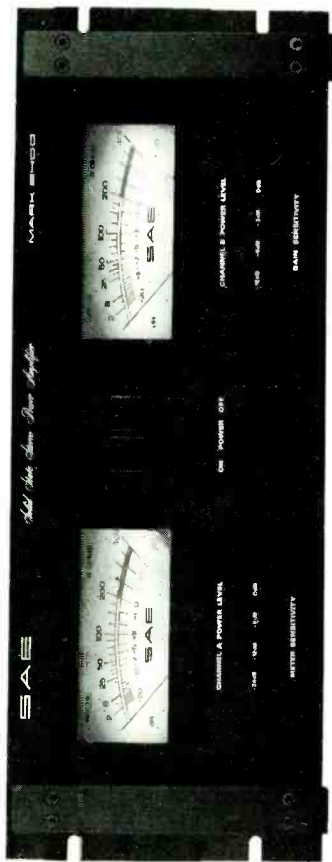
While most manufacturers reserve unique features for their top of the line model, JVC has included SEA in three of its receivers. The S300, the S400, and, of course, the top professional—the S600.

When you hear these receivers at your JVC dealer (call toll-free 800-221-7502 for his name), think of them as two components in one. In fact, it's like having all the benefits of a graphic equalizer... without buying one.

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formance. But, the acoustical qualities of the auditorium (not discussed in the interview!) are more important. Evidently, Kazdin's current approach (e.g., the recent Boulez *Carmina Burana*) [That recording was conducted by Michael Tilson Thomas, not Pierre Boulez—Ed.] does not set out to capture the sound of a concert hall at all, but rather employs considerable artifice in the service of an "idealized" realization of the printed music score.

A "pure" system would employ only one mic per channel: as long as there is "leakage" between mics, mixing of more than one mic into a single channel introduces irreversible phase irregularities and may, concurrently, diffuse the envelope of natural reverberation. If three mics sound good, it does not follow that thirty mics will sound ten times better! On the contrary. Altho engineer Bob Fine mixed three mics in recording the Mercury stereo discs, his set-up remained strongly tied to mono: the best possible single-point-source (mono mic) was not moved, while two side mics were added to contribute equal amounts of left and right difference information. This is a far cry from Kazdin's approach, in which there is no single, primary focus or point of view; his basic pick-up is itself a composite signal, coming from many directional (cardioid) mics located all over the place.

A basic feature of the multi-channel approach is that it affords the option to alter balances electrically during remix. However, unnatural changes in presence and perspective accompany gain-riding: instruments seem to appear from out of nowhere, and to get larger in size when they get louder (e.g., the tambourine in the Boulez *Daphnis et Chloe*). The intensity at which an instrument is played is related to, but not the simple equivalent of its loudness. And, a stable stereo image and sense of place, if not captured by the mics at the recording session, cannot convincingly be supplied by the addition of artificial reverberation later on . . .

Kazdin describes his mission as being to arrange the mics and musicians so as to make sure we hear everything in the printed score. The familiar arguments against what Kazdin does to achieve this are that composers imagine the orchestra as being heard from a single point (the room sound being an essential part of the music), and that each conductor's interpretation

ought to be elicited from the orchestra by him alone, as it is at a "live" concert. Kazdin makes many cogent points relative to these matters, but does not fully refute these objections. Purists would also argue that while extensive splicing may produce a letter-perfect rendition, certain performance qualities are mangled in the process.

—Doug Pomeroy
 Brooklyn, N.Y.

Mr. Pomeroy, a freelance engineer-mixer, was formerly with Columbia Studios in New York City.

Reader Takes Issue with Pioneer RG-1 Lab Test

I am responding to two articles in your June/July issue. On page 63 Len Feldman states the opinion that the proliferation of these devices (Dolby, Auto-Correlator, compress. expanders) may lead to the same confusion that was responsible for stunting acceptance of four-channel. I AGREE. Therefore, I would like to take issue with L.F. and N.E. in their review of the Pioneer RG-1. As a former audio salesman, I have used this unit personally and find its lack of "breathing" remarkable, even great. What I disagree with is the statement that the unit does not affect low levels. By reading the manual and its charts, it can be seen that when properly set the unexpanded gain is -3 dB. This really helps to round out the soft fades at the end of some songs, lowering the subjective background noise. If the unit is switched out at such moments, the difference is easily audible. I think the real misunderstanding is that people expect a change in *tone* rather than dynamics, and miss the really subtle help this unit offers.

I am glad to see the measured S/N ratio, which I couldn't find in the manual. And at 98 dB (!) I wish this really IN-audible unit the best of luck.

—Wayne Walter Erfling
 Davenport, Iowa

A Disillusioning Synthesizer Article?

Recently I had the occasion to read your third issue. While it offers much information that one unfamiliar with recording might find useful, on occasion there is gross misinformation which could result in disillusionment on the part of your readers.

One such example of this is the article by Edd Kalehoff entitled "THE

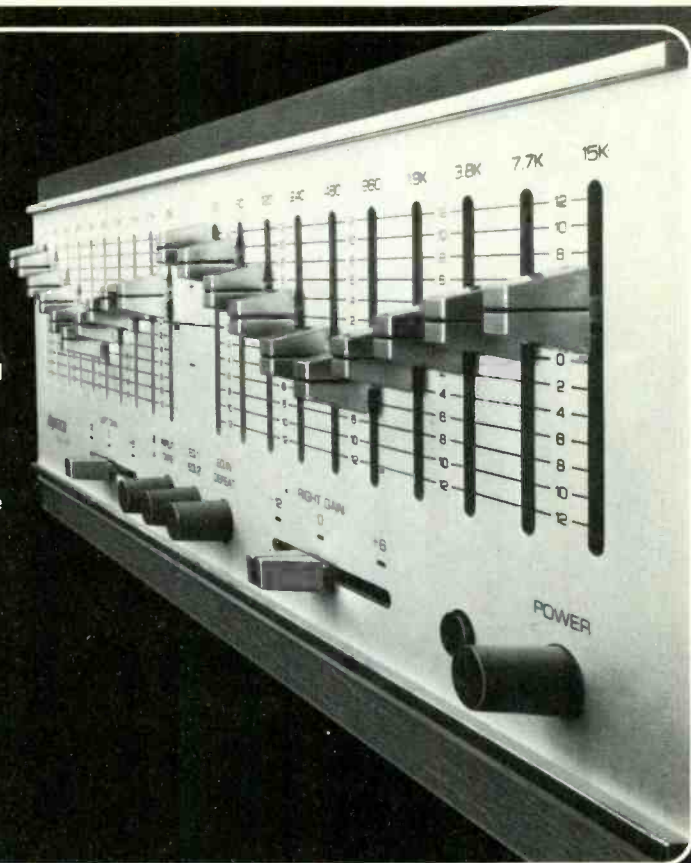
octave equalizer

Dyna's new SE-10 Equalizer will astonish the experts who have rejected the sound coloration of other designs. The SE-10 is probably *the finest sounding* equalizer—certainly at its cost.

It's easier to use, more tolerant, (forget overload, switch pop, and unity gain problems) and has greater versatility. Two separate line in/out pairs, plus tape monitor on one (12 jacks). No inductor saturation, with a hybrid concept utilizing new design IC-simulated inductors at the four low frequencies, and superior performance gapped pot core inductors above 300 Hz, with all polyester control circuit capacitors.

8 ICs, 2 FETs, 5 transistors; IC-regulated power supply; 600 ohm output; typical distortion below 0.01%. Dynakit construction with a single pre-assembled circuit board is fast, easy and fun. Compact Dyna size. Optional wood cabinet shown; rack-mounting accessory panel kit available.

Suggested list \$249 kit \$349 assembled



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The output transformer is the key to the performance of every tube amplifier. Dynaco transformers have been world famous for more than 20 years, and this latest computer-designed version in the Mark VI alone weighs 19 pounds! 120 watts into 4, 8 or 16 ohms at low distortion; recessed front controls for input level, bias adjustment, and the large lighted meter which reads bias or output; front speaker fuse; time delay relay; added XLR input and phone jack output; frequency response 10 Hz to 40 kHz, +0, -1 dB; hum and noise more than 95 dB down; 1/8" steel rack-mounting panel; less than 10 hours to complete the kit.

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SYNTHESIZER, an unfathomable sound generator."

While the Moog name became synonymous with synthesizers in the mid-60's, it was certainly neither the first nor the only good quality unit available at that time. It is not my purpose here to give an historically correct version of synthesizer lineages, but to point out a more serious problem.

There is no one, correct, acceptable approach to synthesizer design, as each unit has a specific purpose. Thus, the statement that all previous synthesizers "had at least one major defect" is not only naive but absurd. The theremin, used in concert in the middle 1940's, demonstrates this.

Whereas it was presented as opinion that "the best units are made by Moog," I would suspect that Robert A. himself would not belittle the units made by such companies as Buchla, Electronic Music Laboratories, Electronic Music Studios, and others which offer complete lines of professional quality units, each significantly different from Moog in concept and design. All of these companies offer portable as well as studio units, and some units, the author might be surprised to find, may suit his needs better than the unit pictured in the article. Why were these units omitted?

With regard to the admittedly slow process of tape splicing, known as "concret technique," this has *not* been outmoded, as the article implies, and there are some sounds and effects that are best done in this mode.

In closing, I would like to suggest that the editors of your publication take a more energetic attitude toward providing *full* information to your readers, as the area of recording is an exploratory one in which the successful are those with the best knowledge of the most options.

Not that I am positing myself as an authority on synthesizers, but I have studied electronic music, and I currently run a recording studio at the above address [Terra Tu, Inc., 4420 Superior Ave., Cleveland, Ohio 44103]. We will be glad to offer our services as resources to those seeking involved information on specific questions.

Letters should contain a self-addressed, stamped envelope for our reply, and be sent to my attention. Good luck with future issues.

—Neil Gould
 R&D Audio & Acoustics
 Cleveland, Ohio

Lab Test Criteria

I am very happy to see your new publication featuring the groundfloor basics of the audio trade. I do think however, that you are missing an important point with your equipment test reviews, particularly with your unique theme.

There seem to be more than enough "hi-fi" magazines available to test the myriad turntables, tuners, amps and consumer tape decks on the market. The hi-fi type equipment can usually be examined and evaluated right in the dealer's showroom since the environment of the living room or the home studio are not so different than that of the retail store. The differences between the store and a 5000-seat hall on the other hand are quite substantial. It is also rather difficult to bring a six-piece group into the store to check out a 16-input console, but this is really the only way to get a reliable idea of how this \$4000 investment is going to perform. I believe that your tests should be aimed at the mixers, compressors, equalizers and other items of audio gear that no one to my knowledge has ever published comprehensive operational tests on.

I realize that this letter is a little too long to run in your letters column, so please regard it as a direct request to you to really make a difference in the options that your readers have when faced with the problem of selecting from the hundreds of brands & models of equipment available to them.

—Ed Casey
 Rockville, Md.

P.S. Yes, 4K is a little low for a 16-in board, but times are tight.

The hi-fi equipment tested by MR is selected because the unit offers special "active" advantages beyond its conventional functions (e.g., a cassette deck capable of mixing facilities). Amps are chosen carefully with power capacity in mind. Turntables and speakers are necessary items in a sound studio, and we review them whenever we feel that the design warrants major coverage. We do not feel that tuners or receivers are recordist gear. And, of course, we shall continue to review mixers, compressors, equalizers and other items of audio gear, just as we have in this and past issues.





Two Electro-Voice engineers have a quiet discussion about the merits of dynamics vs. condensers.

The discussion is easy to settle because there are such obvious differences. Take our RE20 dynamic and our new CS15 electret condenser:

RE20 Continuously Variable-D Dynamic:

It's designed to be virtually free of proximity effect and p-popping. And it's designed for as near perfect response 180° off-axis as the state of the art allows. Also, we planned it to take SPL's you wouldn't believe.

Can It Deliver?

In the anechoic chamber, the RE20 exhibits the widest, most uniform response curve of *any* available cardioid dynamic. The RE20's cardioid polar patterns are almost identical on axis and 180° off. It has excellent transient response.

And The Durability?

This microphone's grandfather could drive nails into pine boards and continue to perform unabashedly. The RE20 adds the ability to handle very high inputs. That's durability. We back this claim with the strongest dynamic microphone guarantee in the business.

CS15 Single-D Cardioid Condenser:

It's designed to be light, to reject off-axis sound, and to provide controlled bass boost. In the recording, broadcast and sound reinforcement jobs where a swinging singer has two mike positions, close and closer, or the bell of a trumpet is surrounding the mike, it's designed to deliver wide, smooth response. And we've developed an electret that can endure SPL's that would have blown the charge off earlier electrets.

Can It Deliver?

In the anechoic chamber, the CS15 exhibits the wide, uniform on-axis response characteristics of the most expensive condenser microphones. Its off-axis response is excellent also. The microphone can be powered remotely with from 8 to 48 volts.

And The Durability?

The CS15 condenser is every bit as rugged as our most rugged dynamic.

We back this claim with the strongest condenser microphone guarantee in the business.

Specifications

	RE20	CS15
Model Number	RE20	CS15
Element	Dynamic	Electret Condenser
Polar Pattern	Cardioid	Cardioid
Response	45 - 18,000 Hz	40 - 18,000 Hz
Output Level (0 dB=1 mw/10 dyn/cm ²)	-57 dB	-45 dB
Max. SPL (1% THD or less at 1 kHz)	greater than 150 dB	141 dB
Impedance	50, 150, 250 ohms balanced	150 ohms balanced
Case Material	Machined Steel	Machined Steel
Sugg'd Resale Net Price (Slightly Higher in Western States)	\$315.00	\$225.00

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TALK BACK

"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 reader's technical forum.

Ground Loops

I am a bit confused as to the term "Ground Loop!"

I understood that if an entire audio system used three-wire A.C. supplies, and balanced audio signal lines, you would never have to worry about the guitarist being shocked when touching microphones or humming in the signal lines.

Could you please explain the concept of a ground loop, why it happens, and what effects it has on a system.

—Brian E. Flinn
Elburn, Ill.

Grounding is one of the confusing problems in electronics. A ground loop is only one of the grounding problems. The best definition of a ground loop is "the inability to provide the same potential at two different ground points." This can be due to the fact that when more than one piece of equipment is used, multiple grounding points are involved. When it is grounded at different points, a 60-cycle hum and noise in the ground loop

is introduced into the signal inputs. The best way to understand this problem is to analyze Illustration 1.

AC ground wire contains all types of noise and 60-cycle hum because its purpose is to divert them into the central ground. In addition to passing directly from Point A to Point B, some noise and hum also splits and goes into the guitar amplifier. The guitar-amp signal output is connected to the console input with a shielded wire. The undesired current conducted by the shielding is magnetically introduced into the signal being passed into the console and then to Point B. Although this current is very small, the relative conductivity could be such that the system would oscillate or produce undesired hum.

To correct this problem, remove the ground pin on the guitar-amplifier line cord. Shocking should not occur because the guitar amp is still grounded

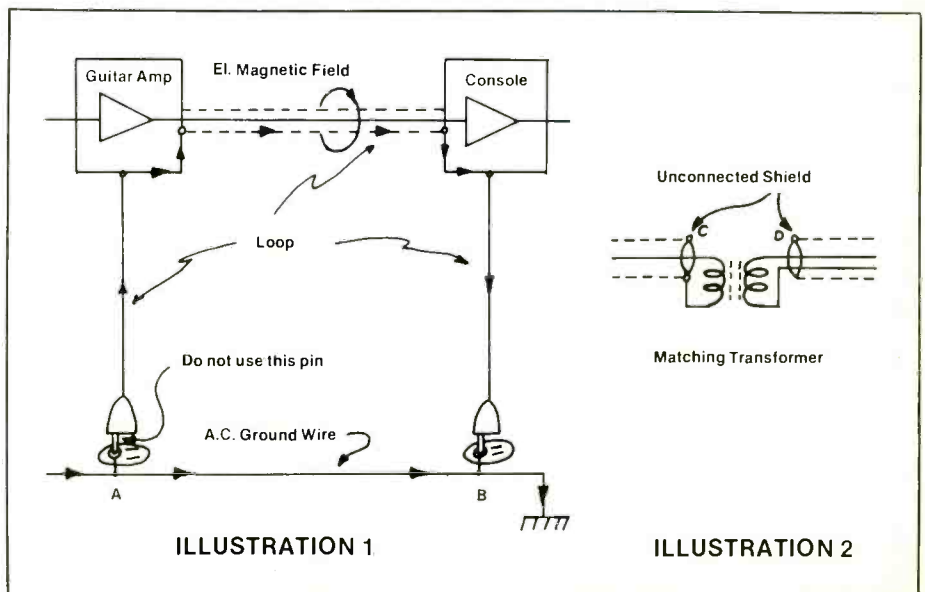
through the console; but it may occur if a line-matching transformer is placed between the guitar amp and the console and the shielding was not connected between C and D. See Illustration 2.

If shocking still occurs, connect the guitar-amp chassis ground to the guitar-amp signal ground. (Some guitar amps have separate signal ground and chassis ground.) Or the chassis of the amp must be grounded to a central ground or the console ground. When none is available, remember that not everyone can get a charge out of their music.

—Sami Uckan, E.E.
Atlantic Studios
New York, N.Y.

Turntable Drive Systems

I'm not clear on the various mechanisms used to drive turntables. For ex-



ample, hysteresis-synchronous, direct drive, belt drive, servo-motor, etc. Can you give me a basic rundown?

—Robert Snyder,
Sacramento, Cal.

Basically, there are three types of drive mechanisms: direct drive, belt drive and rim drive. The DC servo-motor is used in direct drive systems, and the hysteresis-synchronous motor in belt- and rim-driven systems. There are exceptions—including the Philips GA 212 and the Bang & Olufsen Beogram 4002, which utilize medium-speed DC servo-motors—but not many. First, let's examine the drive systems.

In a rim drive system, the motor shaft presses against an idler wheel, usually hard rubber, and the wheel presses against the rim of the platter. This technique permits the motor speed, which is hundreds of rpm in the synchronous motor, to be reduced while torque is transferred to the platter. Since the motor rotates at a constant speed which is not changed easily, platter speed changes are accomplished by moving the idler wheel to align with portions of the motor shaft which have been machined to different diameters.

In a belt drive system, the motor shaft is fitted with a pulley. The pulley is coupled to another pulley (concentric with the platter) by means of a rubberized drive belt. The belt helps to isolate the platter from motor vibrations, thus reducing rumble. Since this system also uses a constant-speed motor, platter speed changes are accomplished by moving the belt onto pulley segments having different diameters.

Direct drive systems have no belts, pulleys or idler wheels. The motor shaft is situated directly below the center of the platter, and the spindle is usually an integral portion of the motor shaft. Therefore, the direct drive system requires a motor to rotate exactly at the speed of platter rotation, i.e., 33 rpm or 45 rpm. The variable-speed DC servo-motor is ideal for this application.

Turning our attention to the hysteresis-synchronous motor, it derives its constant speed in a relatively straightforward manner, utilizing polarity reversals in the AC power line. Such motors must, therefore, be used only with one designated main frequency, 60 Hz or 50 Hz. The actual running speed of the syn-

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chronous motor may be anywhere from about 300 rpm to 900 rpm, or higher; speed reduction to 33 rpm or 45 rpm is done with pulleys or idler wheels since gear reduction would create unwanted vibration.

The DC servo-motor contains circuitry which generates a high-frequency reference signal, typically 50 kHz. A strobe-like mechanism of sensing coils "tells" the control electronics how fast the motor is actually rotating, and the electronics compare this speed to the reference signal. Almost like a computer, the control electronics adjust the DC voltage to the motor to achieve the desired speed . . . a form of motional feedback. This technique of speed control makes the servo-motor immune to fairly large line voltage fluctuations, and completely independent of the AC line frequency. Speed changes from 33 rpm to 45 rpm are done electronically by changing the feedback characteristics. In contrast to the constant-speed synchronous motors, most servo-motors can be manually adjusted for speed variations of about $\pm 5\%$; this is done by varying the reference signal frequency.

The direct drive/servo-motor systems have several advantages over belt or rim drive/synchronous motor systems. Direct drive has no speed reduction mechanism, hence no bearings or rubber friction-dependent surfaces to cause slippage or to wear out. High-speed synchronous motors invariably have some vibration, which is translated into low-frequency rumble by the speed reduction, but servo-motors rotate at low speeds with the platter's flywheel effect acting to smooth out any potential speed variations. The synchronous motor develops considerable 60 Hz (or 50 Hz) flux densities, which can be shielded partially by mu-metal, but the servo-motor operates from DC, so there is no AC magnetic field to induce hum in the cartridge. A related factor, the servo-motor is brushless, so there is no commutator sparking to create noise, and there are no brushes to wear out.

In summary, the DC servo-motor is more stable, and potentially is quieter than hysteresis-synchronous motors . . . mechanically, electrostatically and magnetically. Direct drive systems utilizing servo-motors will tend to require less maintenance than belt- or rim-driven systems. However, the direct drive/servo-motor systems require complex control electronics and precision machining that make them

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more costly than other mechanisms.

If you're shopping for a turntable, and your budget is limited, there are many belt-driven turntables with performance specifications that rival direct drive systems. So check the features and the price, and be sure to listen, if possible, before making your decision.

—Gary D. Davis,
Freelance writer and engineer,
Gary Davis & Associates,
Reseda, Cal.

Multi-Track P.A.

I am interested in modifying my sound reinforcement service to include multi-track recording and I have a few questions for your experts.

(1) Since pro gear is very expensive, I've been thinking about checking out used recorders. What should I look for to keep from getting stung?

(2) My budget will allow approximately \$10,000 to purchase both the console and the recorder. Should I split the money 50-50 between them, invest more initially in the board, or buy the best recorder I can afford?

(3) In starting a studio, would it be wiser to invest in an eight-channel semi-pro recorder for more flexibility, or to use that money towards a truly professional four-channel machine?

—Bruce Gold
ANA Productions
Valparaiso, Ind.

The first and main thing you want to look for is head wear. Check to see if the heads have any excessively worn areas. If the machine has had proper care, the heads, guides, and pinch roller should be worn evenly. I would surely advise running a test tape on the machine. Proper maintenance and alignment is the key to longer machine life.

In answer to your second question, I would first decide if I intended to make a further investment (over and above the 10K you mentioned) down the road. You also must decide on the number of tracks needed. Don't forget you need two recorders of equal quality. Your stereo machine is just as important as your multi-track. You should be able to get a new half-inch eight-track recorder with noise reduction, a fairly decent console, and a two-track recorder for about \$10,500.00. This will *not* be (as one advertiser states) strictly professional, but you will have the capabilities of cutting masters

and not be ashamed of them. The professional consoles start approximately at a price of \$10,000.00, so you will have to compromise.

Nowadays, the eight-track is more acceptable than the four-track. I would suggest a semi-pro half-inch eight-track recorder with dbx noise reduction. This way you will have the flexibility and acceptable signal-to-noise. Headroom and signal-to-noise are very important considerations when purchasing a half-inch eight-track recorder if you are trying to get a professional sound. dbx will give you 30 dB of noise reduction and 10 dB of extra headroom. You will definitely need this on a semi-pro eight-track recorder to get the professional quality.

—Emil Handke
Nashville Studio Systems
Nashville, Tenn.

Barber Shop Quartet Recordings

I am very active in Barber Shop music, singing in two choruses, two quartets and doing recording for all of these. I have numerous specific problems that I wish to ask some clarification about. The music basically, although not a very wide frequency range, is an extremely wide dynamic range and presents specific problems in this area. The fundamental harmonies involved consist of the intentional generation of harmonics up to perhaps 10 kHz. Our present equipment consists of four AKG D1000 microphones, suitable matching transformers, TEAC Mark II mixer and a TEAC 3340S tape recorder. A stereo nine-band equalizer is also available.

I have two basic problems. (1) for P.A. use, I am told that it is considered best to utilize a single microphone centrally placed in front of a quartet approximately six feet from the singers (who are equal distance from the microphone) and to use a high-quality omni-directional type of microphone. However, for the pressing of records and making of tapes, stereo recording is preferred and the optimal mic placement and types of microphones, orientation, and so forth, is not quite so clear to me. I have been using two AKG D1000's aimed toward each other at an approximately 70 to 80 degree angle, and in this way, picking up opposite sides of the quartet with an overlap in the middle where the lead singer is usually placed. This appears to give satisfactory balance, but I would appreciate any

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further suggestions for miking of this particular type of music. For chorus recording, a similar stereo pair has been placed approximately 10 to 12 feet off of the stage level overhead at approximately the center of the chorus and 12 to 15 feet in front of the first row of singers. I wonder if I would be better off using omni-directional microphones, or does this arrangement appear satisfactory in your opinion.

(2) The second problem consists of the difficulties of recording wide dynamic range material. Commercial limiters appear to operate purely as limiters and I am anxious to obtain a device or build myself a device which can operate as a compressor-limiter in recording and can also be hooked up in the playback modality to provide an expander function, thus restoring dynamic range during playback and listening in my studio. The remaining sound equipment consists of a Heathkit AR1500 stereo system of 60 watts per channel driving two JBL 100 loudspeakers for playback. Could you please comment on the adequacy of this system and the availability of compressor-limiters and expanders in a single unit. I would also appreciate any information you have as to engineering detail on how to design and build

such equipment, as I am readily able to do this having an electrical engineering minor background.

—R.C. Thompson, M.D.
Easton, Md.

From your question, Doctor, I presume that you wish to satisfy problems arising out of the desire to do a "live" concert with proper sound reinforcement and still exact an accurate professional-sounding recording simultaneously. Obviously, it would be easier to treat each separately, but being the incongruous humans that we are we must set about doing things in the most compromising way we can.

(1) Fortunately, since your program material is basically a capella, this simplifies everything and eliminates 95% of the difficulties you could be plagued with. Normally, you would have to make a choice as to which is more important—the recording or the "live" performance. Or you would have to run two different sets of mics or at least split them to feed both a P.A. mix and a recording mix. The reason for this is that sound reinforcement is just *that*—reinforcing a sound that is already there (unless you are projecting to a crowd of fifty or so thousand).

A recording, on the other hand, must capture *all* the sound and preserve it exactly as it emanates from the source—clearly two different needs which require two different approaches. This is a somewhat more important consideration than the mono vs. stereo problem that you are faced with, although you are quite right about wanting a stereo recording, as there are no mono records being commercially produced anymore. But even that problem is minimized in your case.

Actually, you are doing quite well, as your mic placement and technique is rather sound (so to speak). You are using the basic 45°/45° miking system which is ideal for two reasons: (1) It results in a very natural stereo spread, and (2) if you must feed a P.A. system, mixing the two mics into a mono signal will not result in the notorious 3 dB center build-up.

So the suggestion is this: set up your recording system as you normally would, feeding the mics in the stereo pattern into the mic inputs of the model II mixer, pan left and right, respectively, and feed the recorder from the mixer. Then take an auxiliary output from the mixer (even an unused echo buss) and feed the P.A. system's high-level input

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from that. In your case, there is no need to use a separate single mic for the P.A. amp, as the stereo pair is ideal for this purpose. Just make sure the mics are wired in phase.

As far as improving your mic technique goes, that would be difficult. Here are a few more things to try, although they may not necessarily result in improvement. Try working closer to the stereo pair, with the quartets about three to four feet away instead of six feet. This will require closer attention to spacing and balance, but will result in a more present sound. The cost will be loss of ambience. To get the ambience back, place a couple of mics aimed at the back of the hall and judiciously mix them into the recording but not the P.A. feed. If you are happy with the ambience or reverb you're getting now, don't touch a thing. If you are getting too much, try using more directional mics which should suppress just about any return from the rear of the auditorium. I would not, however, use an omnidirectional mic for P.A. work, as it would bring you closer to feedback.

Other than that, I know of no way to improve on your set-up without getting very elaborate, and that does not guarantee mitigation (all too often it almost insures degradation). I think you will find that the simpler the set-up, the more natural will be the results for your type of recording.

Oh, by the way, don't think for a minute that you are limited to 10 kHz. You are still generating sound to beyond audibility. Consider this: the lowest note on a string bass has overtones to 16 kHz. So if you have honest basses in your groups, you could have fundamentals of 90 to 100 Hz and sibilants well above 20 kHz. In short, if you're happy with the unadulterated sound coming out of your microphones, as you seem to be, don't worry about it. You're doing just fine.

(2) It has been said that the recording is made on the business end of the microphone and any attempt to tamper with the sound on the recorder end is detrimental or at least unproductive. This, to be sure, can be carried to extremes. But your problem is no different than any other sound recordist's problems anywhere in the world since Edison recited his immortal words into that first recording machine. We are all looking for a way to ride gain automatically and effectively without thumps, breathing compressors and the usual assortment of maladies associated with limiters and compressors. The guy who

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invents the first unit will be wealthy, indeed. Until then, we shall have to put up with people who insist on using limiters to ride gain. Trouble is that compressors don't control sound with the precision required for professional recording. Furthermore, there are very few compressors in the recording field to begin with. Most of them are peak limiters, which are supposed to have no audible effect on the program—and, if used properly, the good ones don't.

In "live" music, there is a practical dynamic range of about 90 dB. On recorded music, the range is closer to 20 dB before demon noise comes lurking up from the depths. So what you probably want is noise reduction. This will give you from 10 to 30 dB more dynamic range than with straight recording. There is the Dolby A-type system, which is the professional model, and the B-type for consumer use. The difference in price will give some indication as to how well each works. Then there is the dbx system, which offers two or three levels of proficiency. Basically, both operate on a complementary compressor-expander system, but each type of system is incompatible with the other. Dolby is more prevalent in both the professional and consumer

fields, so statistically you will be able to play your Dolby tapes in more places. But both Dolby systems require rather finicky adjustment, alignment and attention to level calibration. The dbx is not so critical. There are pros and cons for each system and then there is price.

As far as building your own, with all due respect to your engineering proficiency, there have been many highly experienced design engineers who have been working on these problems for the past 25 years—enough said? Not only that, but if I could give you information on how to make one of these things I wouldn't tell anyone—I'd do it myself and make a fortune!

When we get into the adequacy of one brand over another, including comments on your system that you describe, you will note how subtly I stay away from that area. Heath has always made good equipment, and speakers are a matter of personal choice. If you like the way they sound, you couldn't do better than if you were to spend \$2000 per speaker on something else. But further than that my opinions are my own; they are rather strong, and frankly I don't think MR's legal department is quite ready for me. I could probably get them into

more trouble than the fellow who used to reside in the White House a few years ago.

—Dave Moyssiadis
Frankford/Wayne Recording Labs
Philadelphia, Pa.

Roberts Recorder Info

I own a Roberts 400X solid-state reel-to-reel and I need a few questions answered if you would be so kind.

(1) Where can I find the 10½-inch reels and adapters for it, and an owner's manual?

(2) There is a switch on the back of the deck labeled "reel size" which switches from 7-inch to 10½-inch, but as far as I can tell it does nothing. Is something wrong?

(3) Is there any way to add on a "sound-on-sound" unit reasonably to the recorder? Has this ever been done?

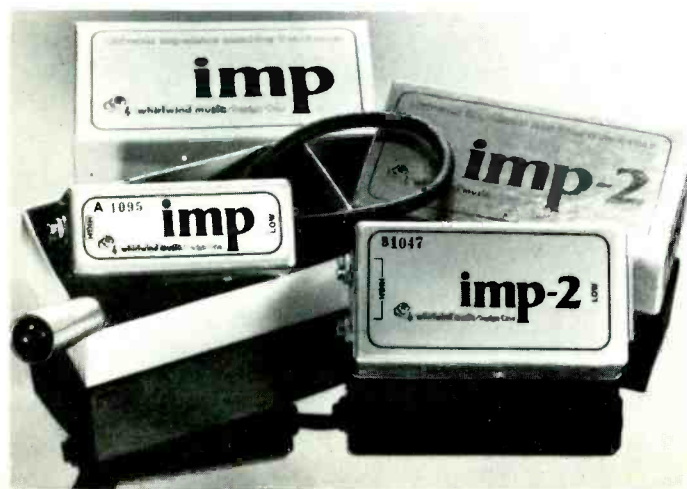
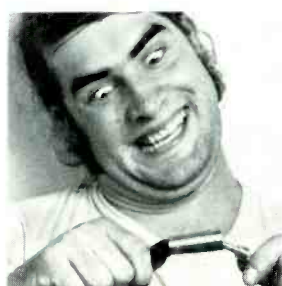
Beautiful magazine, keep it up.

—Robert N. Doran
Havelock, N.C.

To find a part or owner's manual for your Roberts 400X (or for any Roberts model) contact East Coast Transistor Parts, 2 Marlboro Road, West Hemp-

Whirlwind Music Presents Impedance Changing

(or how to fit this into that...)



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Imp-2: Two special features. 1: Direct line from guitar/mike (high impedance) to low impedance input source. 2: Two 1/4" jacks which can be used in parallel to convert signals into one low impedance output. One of the 1/4" jacks can be used as an input for the impedance change, the other to return the signal to your stage amp.

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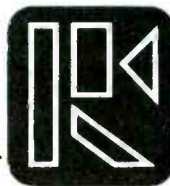
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CIRCLE 72 ON READER SERVICE CARD

stead, N.Y. 11552. Their phone number is (516) 483-5742.

As per your second question, the switch on the back of the deck labeled "reel size" is a switch that adjusts the reel tension on the machine. This is such a slight adjustment that you cannot physically visualize it working.

Yes, there is a way to add on a "sound-on-sound" unit reasonably to your recorder. AKAI does not make them; however, there are other manufacturers that produce a "sound-on-sound" unit.

—Linda Penny
Marketing Services
AKAI
Compton, Cal.

Kepex Vs. Gain-Brain

I understand pretty much how a Kepex system shuts off sound at a given volume in order to keep leakage to a minimum. What I don't understand is what a "Gain-Brain" is and how it can be substituted for a Kepex.

—John Steinberg
Miami, Fla.

The Kepex and Gain-Brain are two recording devices manufactured by the Allison Research Company. The Kepex is an expanding device commonly known as a "noise gate." When properly set, it will allow desired signals, such as a solo instrument or vocal, to pass through it, and "gate" or prevent unwanted signals (leakage) such as other instruments or vocalists and studio noise from passing onto the track. (This system should not be confused with such noise-reduction devices as Dolby or dbx, which are concerned with suppressing recording equipment noise such as tape hiss.)

This effect attained with the Kepex could be manually accomplished by keeping a console attenuator off and opening it when the desired signal is produced—then returning the attenuator to the "off" position when the signal stops.

Keep in mind that a noise gate cannot anticipate when the vocal will begin and when it will stop; therefore the reaction time associated with each function becomes particularly important. The time necessary for the gate to open is called the "attack" time, and the time necessary for the gate to close is the "release" time. How the gate determines when to open and when to close is a function called the "threshold."

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ARP - Model 2600

Woman
Linda - Model
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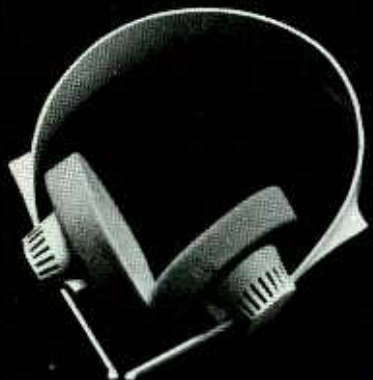
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*Manufacturer's suggested list for Model HD414. Deluxe Model HD424 also available at \$79.75.

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For example, let us look at various signals on a vocal track as it is being recorded. Since the vocalist is singing directly into the mic, all other signals on that track will be relatively weak. When the Kepex is used, all the weaker signals will be completely suppressed so that only the vocalist's contributions remain on the track. Obviously, since the Kepex works according to dynamic response (that is, the difference between loud and soft passages), mic placement is crucial (in order, for example, to avoid a loud cymbal crash getting onto the track when the vocalist is singing quietly).

The Allison Gain-Brain, on the other hand, is a type of limiter or compressor. In all forms of music, engineers must deal with musical dynamics. Limitations must be placed on how much dynamic range is allowed to reach either the tape recorder or disc. The upper recording limit to a tape recorder is called clipping and the lower limit simply noise. The limiter, as its name implies, limits or reduces the difference in volume between the loud and soft passages of music.

As for how a Gain-Brain can be substituted for a Kepex, it can't. They perform totally different functions: the Kepex expands and the Gain-Brain limits the signal.

There are extensions in theory and application to both pieces of equipment discussed that go beyond the present scope; however, this does give solid basis to how these pieces of equipment are used in daily studio operations.

—Jack Sherdel
O.D.O Sound Studios
New York, N.Y.

Recommended Audio Books

I couldn't believe my eyes when I saw *Modern Recording* magazine. Up to this point, my search for literature on recording techniques has been in vain, except for the ever-popular "Audio Encyclopedia" which is practically useless to someone like me who has a very limited technical background. Could you please direct me to other books written on recording techniques. I am especially interested in voice modification, so could you inform me of any kind of units that could do a good job of treating singing voices? I have a 3340D, mixer and soundproofed room, so the equipment would have to be compatible.

—Daryl Duda
Chicago, Ill.

Other books? I thought you'd never ask! There's a brand new book out called *The Recording Studio Handbook* that should be just what you're looking for. Since I'm the author, I'd like to point out that it's the only book available on the subject.

I'd like to do that, but I don't think the editor would let me get away with it, since there are a few other books which you should know about. So, here's a short list of them. (Buy mine first, though.)

Modern Recording Techniques, by Robert E. Runstein. Howard Sams, No. 21037. 366 pages, \$9.95.

Sound System Engineering, by Don & Carolyn Davis. Howard Sams, No. 21156. 295 pages, \$19.95.

Handbook of Magnetic Recording, by Finn Jorgensen. Tab Books, No. 529. 190 pages, \$4.95.

Recording Studio Handbook, by John Woram. Sagamore Publishing Co. 496 pages, \$27.50 (\$35 after Nov.).

As for "voice modification," that phrase can be applied to a host of signal-processing devices, such as compressors, expanders, echo and reverberation systems, equalizers and filters, flangers and such. All will modify a voice or any other signal for that matter. You didn't say what kind of mixer you have, so I can't say much about compatibility, beyond a few general remarks.

Most signal-processing devices are designed for insertion in the line-level signal paths. That means you can't plug a microphone directly into the device. The signal must be amplified first. If your mixer does not have patch points in each input line, this means that the device must be placed between the mixer output and the tape recorder line input (*not* microphone input). If you are mixing several signals together, this means that all of them will be modified, and this may not be what you wanted. However, if your mixer has an extra output, you might route the voice tracks to this output, through the signal-processing device, and then back into another line input on the mixer for combination with the other, non-modified signals. As you can see, the compatibility, or lack of it, depends a lot on the design of the mixer you are using.

—John Woram
Woram Audio Associates
Rockville Center, N.Y.



TANDBERG

10XD bridges the gap between consumer and professional tape recorders.

Meet the world's first and only 10½" reel tape recorder that operates at 15 ips and combines Tandberg's unique Cross-Field recording technique with the world-famous Dolby* B system. Result: A *guaranteed minimum* signal-to-noise ratio of 72 dB, measured on a 4-track machine using IEC A-weighting. Simply put, the 10XD completely eliminates audible tape hiss!

Here are some of the many sophisticated features that make the 10XD the finest tape recorder Tandberg has ever built:

- 3 speeds: 15, 7½, 3¾ ips. Electronically selected
- 3 motors; Hall-effect capstan motor
- 3 heads; plus separate bias head
- Electronic servo speed control
- Electronic logic mode controls, including photo optics
- Electronic balanced microphone inputs
- Echo, sound-on-sound, editing, A and B tests

- Peak reading meters
- Direct transfer from playback to record (flying start)
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Remote control and rack mount optional. Pitch control by special order. For a complete demonstration of this remarkable new advance in stereo tape recording, see your Tandberg dealer.



*Dolby is a trademark of Dolby Laboratories, Inc.

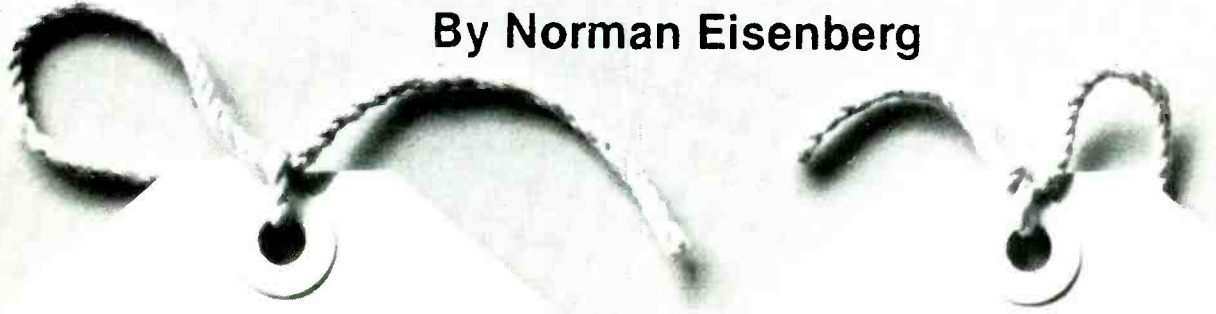
Tandberg of America, Inc., Labriola Court, Armonk, N.Y. 10504
A. Allen Pringle Ltd., Ontario, Canada

CIRCLE 76 ON READER SERVICE CARD

www.americanradiohistory.com

THE **PRODUCT** SCENE

By Norman Eisenberg



STEREO LIMITER/COMPRESSOR

Orban/Parasound's model 418A is a new stereo limiter/compressor that features program-controlled attack and release times, said to enable the device to work "quite subtly with all types of program material" and without the need for critical manual adjustment. A modification of the Orban/Broadcast Optimod-FM Limiter, the 418A consists of a pair of stereo-ganged broadband compressor/limiters followed by a high-frequency limiter with four different time constants, user-selectable via a front-panel switch. This variable time constant feature, claimed to be unique in the industry, permits the characteristics of the h-f limiter to be tailored to the recording medium following the limiter, such as disc, cassette, or 7.5-ips tape.



The manufacturer adds that the operating simplicity of the 418A makes it especially suited as a mix-down machine for use when time is a problem. Inasmuch as most decisions are made for the operator on the basis of an automatic analysis of the input program, the 418A can be used for rough mixes, broadcast production, commercials, and the like. It also is said to be ideal for cassette duplication and for single-channel limiting chores. In a 19-inch rack panel, the 418A is priced at \$950.

CIRCLE 13 ON READER SERVICE CARD

NEW OPEN-REEL TAPE FROM MEMOREX

The term "Quantum" designates a new line of open-reel tape from Memorex which utilizes what is said to be an advanced ferric-oxide formulation "engineered to offer . . . performance characteristics surpassing any other open-reel tape." According to Memorex, the tape has a coating of densely-positioned uniform particles which provides outstanding clarity and sharpness in sound reproduction at all frequencies. Specific advantages claimed for the new tape are lower harmonic distortion, greater sensitivity, and increased headroom when recording to permit greater dynamic range.

This enhanced dynamic range, points out Memorex, will allow the serious recording enthusiast to drive the tape harder than other tapes before running into distortion, thus making for increased signal output at all recording levels. The tape is said to have a higher saturation point than other tapes,



permitting up to 4 dB more signal than in the past. A "sophisticated" binder system is designed to offer outstanding durability and long life, combined with freedom from dust and oxide rub-off during extensive use.

Intended for use on all high-fidelity open-reel recorders, Quantum will be available on 7-inch plastic reels in 1800- and 2400-foot lengths, and on a 1½-inch aluminum reel in a 3600-foot length.

CIRCLE 2 ON READER SERVICE CARD

ARP ANNOUNCES NEW MIXER

From ARP Instruments comes news of the Minus Noise Mixer which includes a built-in patented dynamic noise filter said to actually remove noise



from any program signal. Eight input channels are provided, with reverb options, separate bass and treble EQ, gain, etc. The noise filter is claimed to attenuate hiss up to 17 dB at 10 kHz. Voltage gain to the monitor output is rated at 50 dB; to the main output, 60 dB. The noise filter was developed jointly by ARP and Burwen.

CIRCLE 6 ON READER SERVICE CARD

ELECTRONIC CROSSOVER

A new product that is unusual because of the relative scarcity of the breed is the QSC Electronic Crossover 1.0, announced by Quilter Sound Co. Priced at \$228, it is intended to convert existing passive crossover P.A. systems to bi-amping, and to allow more flexibility in building new P.A. systems. The unit's electronic crossover range covers 200 Hz to 5 kHz, and the device includes a



65-watt (RMS) power amp for high-frequency use, so that this unit plus a low-frequency amplifier are all that are needed for bi-amping. The electronic crossover and the power amp can be used together or completely independently.

CIRCLE 17 ON READER SERVICE CARD

VARIOUS NEW ITEMS FROM SHURE

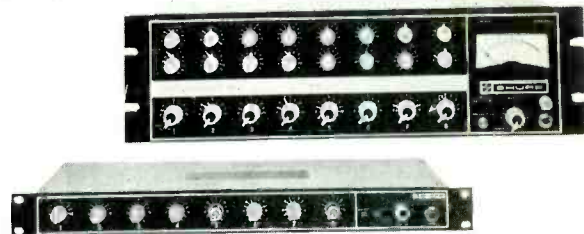
Expanding its SR line of professional sound reinforcement components, Shure Brothers, Inc. announces three new products for use with existing Shure SR units or other sound gear of comparable high quality. One of the new items is the SR 101-Series 2 audio console, rack-mountable eight-channel mixer-preamp. An accessory monitor output permits connecting professional monitor mixers for stage monitoring, multi-channel tape recording, or stereo broadcasting.

Another product is the SR 110 professional monitor mixer, rack-mountable, eight-input, single-output line level device for use when a separate stage monitor mix is needed. Several SR 110's also can be used in multi-track recording, stereo and quadraphonic broadcasts, or as a mixdown panel for sound reinforcement.



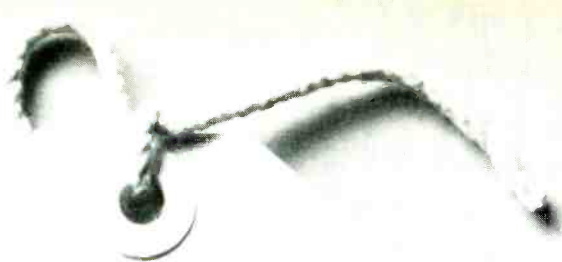
Up to eight of these units can be stacked and connected with a single SR 101-Series 2 console or SR 109 mixer. A mix bus allows two SR 110 mixers to be interconnected, providing 16 inputs when connected to two SR 101-Series 2 consoles or two SR 109 mixers.

The SR 109 itself is a mixer for up to eight microphones with individual control over volume plus high- and low-frequency equalization. LED indicators are used for an adjustable peak limiter and for output clipping level. Prices for these products are: the SR 101, \$1,180; the SR 110, \$150; the SR 109, \$660.



Shure also has a new add-on accessory mic mixer that permits adding up to six low-impedance, balanced microphone inputs (switchable to line level) to a sound system. Named the model M67 and priced at \$181.20, it is designed as a "slave" mixer for Shure products such as the M67 and M68 mixers, the SE30 gated compressor/mixer, the M610 feedback controller, and the M63 audio master.

CIRCLE 5 ON READER SERVICE CARD



NEW LINE OF MICROPHONES



Marlboro Sound Works, a division of Musical Instrument Corp. of America, has introduced a new line of microphones. Five models are offered, priced from \$14 to \$49. Four are unidirectional cardioid dynamics; the top of the line (M400) is a condenser mic. All mics are high output and are intended for stage or recording use. Standard features included a connect-

ing cable with standard 1/4 inch phone plug, on/off switch, and pop filter. The M400 also has a built-in preamplifier.

CIRCLE 11 ON READER SERVICE CARD

STRAIGHTLINE PREAMP

Spectro Acoustics, Inc. has announced its model 217 stereo preamp-control unit. Of straightline design (no tone controls), it does have RIAA phono equalization and a subsonic filter. Provision is made for adding optional outboard devices such as an equalizer, signal processor, and so on. The front panel features a versatile cartridge-loading option that provides a total of 16 different combinations to suit a variety of magnetic phono pick-ups, plus a gain selector to optimize noise and overload conditions as per a pick-up's signal output. High-level switching, in addition to providing a choice of signal source, features bidirectional-bypass copying in the tape monitor section, and stereo or mono operation. The 217's accessory AC facility can handle 800 watts of power (for other components) with 400 watts switchable. Some of the unit's specs include: THD, less than 0.05%; IM, less than 0.01%; RIAA equalization accurate to within 0.5 dB from 20 Hz to 20 kHz. High-level response is rated within 0.25 dB from 10 Hz to 100 kHz, or within 3 dB from 2 Hz to 250 kHz. Unweighted S/N on phono is better than 85 dB; on high-level, better than 96 dB. The unit is priced at \$250.



CIRCLE 8 ON READER SERVICE CARD

ELECTRONIC FREQUENCY DIVIDER

From Teac comes word of a new Accuphase electronic frequency divider. Known as the model F-5, it is designed for stereo systems using multi-amplification for individual speaker systems. Basically a tri-amp design, the F-5 is easily converted to bi-amp operation. It uses a plug-in printed-circuit board for quick changes of frequency crossover points. 16 boards will be available offering crossover frequencies of: 100, 180, 250, 350, 500, 650, 800, 1200, 1800, 2500, 4000, 5000, 6500, 8000, 10,000, and 12,500 Hz. Each board contains two symmetrical configurations for left and right channels, and also provides a selector for 12 or 18 dB per octave cut-off attenuation at the crossover frequency. A special circuit prevents shock noise if the boards are changed while the unit's power is turned on. Also featured are output level controls



CIRCLE 16 ON READER SERVICE CARD

for mid- and high-frequency signals, and a pilot lamp. For rack-mounting, a standard 19-inch front panel is available; this model is called the F-5 type A. THD is given as no more than 0.1% at rated maximum output of 6.5 V. For a 2-volt output, hum and noise are claimed to be down by 100 dB. The device will run on 100, 117, 220, or 240 volts AC (50/60 Hz) and it weighs 26 pounds.

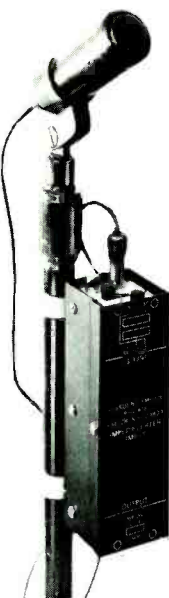
TDK LAB AND PRO CASSETTES

From TDK comes word of a new AC series of cassette tapes, said to provide critical testing standards for audio labs, duplication work and other professional applications. Individual cassettes, for testing various parameters, are priced from \$10 to \$35. The total series includes 12 cassettes as follows: AC 211 (recording alignment); AC 311 and 312 (playback level calibration at 333 Hz and at 1 kHz); AC 313 (Dolby calibration); AC 321 and 322 (head azimuth alignment at 6.3 kHz and 8 kHz); AC 331, 332 and 333 (frequency characteristics at 11 points, 3 points and 4 points); AC 341 (wow/flutter and tape speed); and AC 351 and 352 (crosstalk and head location for tracks 1 and 2).

CIRCLE 7 ON READER SERVICE CARD

"IMPEDAVERTER"

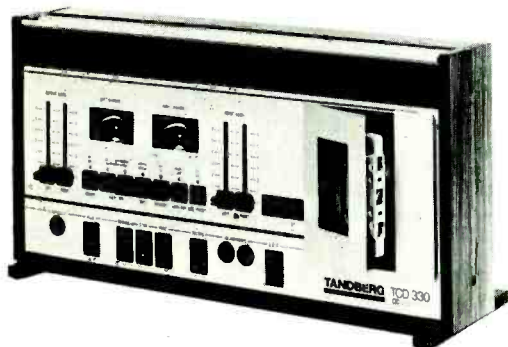
This title describes a new device (also known as model IMP-1) from Rus-sound which is designed to match any microphone or pick-up to any amplifier or recorder. It is said to reduce hum, noise and high-frequency loss even when driving long lines; it offers a choice of five different gain/phase operating modes; dual inputs and outputs permit bridging mic and audio lines, splitting the output to separate recorders and amplifiers, and other uses. It is small enough to be mounted to a mic stand using clamps provided. It also can be taped to a stand or concealed if desired. The device is battery-powered (9 V transistor radio type). Controls include power off/on and function. Measuring 2 by 2 by 6 inches, it weighs 14 ounces. Price is \$59.95.



CIRCLE 1 ON READER SERVICE CARD

THREE-HEAD CASSETTE DECK

Recently off the drawing board is Tandberg's newest and most advanced cassette recorder, the model TCD-330 which boasts three motors, dual-capstan drive, and three heads (separate record and play plus erase) to permit source or tape monitoring as well as optimum frequency response. Other advanced features of the TCD-330 include azimuth adjustment, servo spooling, Dolby noise reduction, memory, dual peak-reading meters, MPX filter, electronic logic control, adjustable preamp output, tape-type selector, recording preset control. Suggested retail price is \$999.



CIRCLE 18 ON READER SERVICE CARD

WHAT IS A PROFESSIONAL TURNTABLE?

In our first issue I took up the question "What's a monitor loudspeaker?" and later (issue no. 4) my colleague L.F. discussed the matter of professionalism in tape recorders. Let's look now at a "professional turntable."

Oddly enough in at least one critical performance area, the existing "professional" standard (the old NAB) is below par for good hi-fi sound. I refer to the NAB rumble standard of -35 dB, promulgated to meet broadcast needs many years ago. The fact is, rumble must be better than that if it is not to interfere with the musical sound of a high-grade modern playback system. Modern rumble tests use some kind of "weighting" which takes into account the rumble frequency; depending on the method used, a good rumble figure for a "professional grade" turntable will be in the -60 dB region.

Wow and flutter (respectively, slow and fast cyclic speed irregularities) should not exceed perhaps 0.1% (WRMS); the fact is most of today's turntables do at least as well or better than that.

Speed should be accurate to within 0.3%—this requirement has less to do with your ability to detect a slightly wrong pitch in music than it has to do with accurate timing of selections for taping or broadcasting work.

Regarding speed, by the way, a hallmark of professionalism in a turntable is high starting torque—the platter must come up to full speed as quickly as possible. This facilitates cue-ups and quick starts—again something tape recordists and disc jockeys will appreciate. A good mark for this would be half-rotation or sooner.

In the last analysis, a professional turntable is a workhorse first and a domestic showpiece last or not at all. It must be able to run for long periods without faltering or overheating, and its controls and operating parts must be made well enough to deliver expected performance even when handled somewhat hastily or roughly in the work-a-day situations audio men often find themselves in.

I would say that these considerations add up to the practical requirements of a turntable that merits the term "professional." As far as I can determine, the models that qualify, as a group, are the big manual single-play jobs. Some of the top-end automatics will do too, but with them there's always a chance of some bug or breakdown—the more complex any machine is, the more areas for possible trouble.



MUSICAL

NEWSIGNALS

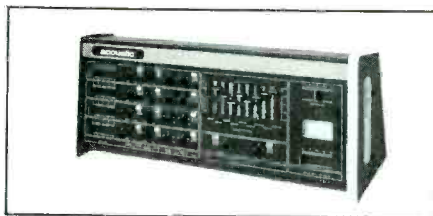
INSTRUMENTS ... Guitarist/designer Leigh Copeland and Alembic have announced the development of the Erecric Guitar, a solid electronic guitar that conveniently folds up into a 24" x 6" x 3½" soft case. Alembic states that the prototype's fold-up features and its good sustain have passed the test of two years of constant use. Electronically, in addition to the features common to most fine electric guitars, the Erecric will have special provisions for the recording guitarist: separate jacks for earphones, accessories, another Erecric, and stereo tape; furthermore, a tape-input volume control will minimize the hardware necessary for recording. In order to finance the production and test the acceptance of the Erecric, Alembic is preparing a first edition run of 18 custom prototypes (\$1,200 payable in advance) which will feature premiere hardwoods and inlays that will not be available on the standard model to follow (Alembic, P.O. Box 759, Sebastopol, Cal. 95472).

SOUND REINFORCEMENT EQUIPMENT ... Acoustic has come out with a number of new products throughout the P.A. spectrum. Their Model 833 mono power amplifier (\$399) delivers 225 watts into 2 ohms and features a front-panel level control which enables the unit to handle inputs from 230 mV to 10 V. The Model 400 stereo power amplifier (\$899) puts out 375 Watts RMS per channel with independent power supplies. The unit has LED overload indicators, forced air cooling, power failure and speaker safeguards, and is rack mountable.

The Acoustic Model 500 keyboard control center (\$649) is a 4-in/2-out mono mixing console. Each input has individual attenuation, tone controls, LED's, line faders, and two effects inputs with send switch and level controls. Other features include two

master effects inputs (with send and level), 9-band EQ, contour control, foot pedal, crosspatching system, and two master output level controls.

The popularity of the Acoustic 890 mixing console (10-in/3-out) has led to the production of a pair of smaller, more portable consoles designed primarily for "live" mixing. The Model



860 (\$1,399) is an 8-in/2-out mono board and the Model 880 (\$2,799) is a 12-in/3-out stereo board with a crosspatching system. Both consoles feature LED overload indicators, 9-band graphic EQ, VU meters, and recording outputs.

New speaker systems from Acoustic include Models 806 and 807 speaker enclosures. The former (\$349) has one 15-inch speaker, a midrange horn, and a piezo-electric driver and will handle up to 125 Watts into 4 ohms with two 12-inch speakers, a midrange horn and a pair of piezos. At the top of the line, Acoustic has added the 811/812 speaker system which can be bi-amped for optimum performance. The 811 top (\$599) has a heavy-duty driver and sectorial exponential horn plus six piezo-electric drivers, and the 812 bottom (\$799) houses a 500 H2 crossover and four heavy-duty 15-inch speakers. All Acoustic products can be covered for life under their optional protection program (Acoustic Control Corp., 7949 Woodley Ave., Van Nuys, Cal. 91406).

The Piezo Super Horn (\$17.50) is a compact (3⅞" x 3⅞" x 2⅞") solid-state driver that can be incorporated into

P.A.'s, musical-instrument amplifiers, or stereo systems (regardless of impedance) for added brilliance (high-frequency output). No crossover is necessary in that the frequency response is flat (± 3 dB) from 4,000-30,000 Hz and drops off rapidly below 4,000 Hz. The Piezos handle 25 Watts RMS and can be connected in series for increased output (Marlboro Sound Works, 170 Eileen Way, Syosset, N.Y. 11791).

The Strad-o-Mike (\$29.95) is a wax-mounted pick-up that fits over the strings of an acoustic guitar. The unit is equipped with plastic spacers and screws and a hi and lo impedance switch (Strad-o-Mike, Box 921, Yuba City, Cal. 95991).

The Shure SR106 Electronic Crossover (\$150.00) is a rack-mountable, unity-gain, selectable frequency network designed for use in two- or three-way speaker systems. It uses bi-amplification to separate a console or mixer-preamp output into two frequency bands at 500 Hz, 800 Hz, or 2600 Hz for distribution to separate



power amps. Tri-amplification can be achieved through the addition of a second SR106 to the system (Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. 60204).

The Delta Concept One (\$1,600) is a tube amplifier designed for "live" performance and recording. The amp, which handles 300 Watts RMS, features five pre-set tone circuits (Delta,

Tele, Gib, Fend, Mar) in addition to treble, bass, and midrange controls. A built-in 8-Track cartridge tape echo has controls for variable delay, repeat (up to infinite), and mix. Damping and distortion controls are provided, as is wide-range tremolo. The speaker system consists of four open-back 10-inch and two 12-inch ported speakers. Studio-designed features include 30-Watt output in studio (vs. stage) position, 600-ohm "live" outputs, and linear volume control. (Delta Products Corp., 8828 Lankershim, Sun Valley, Cal. 91332).

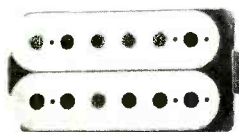
The Roland JC-60 (\$525) and JC-120 (\$750) Jazz Chorus Solid-State Guitar Amps feature the "Chorus Effect," which is described as a softened, full, wide-spreading sound comparable to that of a 12-string guitar. The musician can choose between the "Chorus Effect" and pitch-modulation vibrato (as opposed to tremolo). Other controls include treble, middle, bass, distortion and reverb. The JC-60 puts out 60 Watts RMS through one 30 cm speaker. The JC-12 is rated at 120 Watts RMS with two 30 cm speakers and also features a normal channel (volume and tone controls only). Both amps have high- and low-impedance inputs. The Roland CE-1 Chorus Ensemble (\$169.50) is a new pedal unit that produces the same tonal multiplication effect on vocals, keyboards or other instruments. (Beckman Musical Instruments, 2117 Yates Ave., Los Angeles, Cal. 90040).

ACCESSORIES . . . The Heil Talk Box (\$150) isn't really all that new, but its sudden popularity certainly is news. The Talk Box achieves the "talking guitar sound" by feeding the guitar amplifier's output through a plastic tube that the guitarist holds between his teeth. As the sound comes out of the tube, the guitarist/vocalist "shapes" the sound with his mouth and it is miked in the same manner. A foot switch on the box allows the guitarist to switch back and forth between the effect and the guitar's normal speaker system (Heil Sound Systems, Heil Industrial Blvd., Marissa, Ill. 62257).

Choice makes cases for all major brands of guitars, basses and portable keyboards, plus boxes and trunks for mics, accessories, etc. (Choice Product Development 800-227-0680 toll-free outside Cal. or 415-798-0982 in Cal.).

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HOME VIDEO

HERE AT LAST?

Although the manufacturers of high fidelity components have had a pretty good thing going for the past twenty years, many of them have secretly envied the huge amounts of money made by television manufacturers. And many have nurtured hopes of sneaking into the television business someday.

Now it appears that it may be about to happen, with high fidelity component manufacturers like JVC, Sony, Panasonic, Advent, Philips and Telefunken gearing up to produce products which could best be described as links in a television component chain. From JVC, Sony, Panasonic and Sanyo, for example, come videotape recorders low enough in cost and simple enough to use that they may soon begin turning

up in people's living rooms. RCA and Philips are hard at work on videodisc playback systems which they hope will achieve the same results at even lower cost. And Advent and Sony are merely two manufacturers of projection television systems, the equivalent of a corner horn in a video component system.

Actually, the promise of do-it-yourself television has been around for more than a decade. It was in 1966 that the British Information Service announced a \$164 tape recorder which would record and play back pictures as well as sound. The recorder never really made it to market—and when it was demonstrated in New York, the picture quality was blurry and indistinct. But that announcement spurred manufacturers like Ampex, Panasonic,



Shibaden and Concord to produce home video recorders of their own.

Unfortunately, these recorders cost upward of \$1000 and were black & white only—introduced at just the time that color was beginning to become popular. The cost of tape was high—as much as \$1 a minute in recording time. And the machines generally were complicated to use. They found use in industrial situations



RECORDING

By Robert Angus

—the Reading Railroad bought a dozen Panasonics to keep track of freight cars on its system; American Airlines installed Sonys to play movies on some of its flights. But the recorders never made it in the home, and most of them disappeared.

The dream of TV programs originating in the living room persisted, however, with RCA experimenting with an embossed plastic tape under the name SelectaVision; with CBS's EVR (Electronic Video Recording); and Sears Roebuck's flirtation with a true color videotape system called CartriVision. It cost \$1600 for a color player and promised a wide catalogue of program material. Unfortunately, few of the programs ever really existed. All three offered color; all three were envisioned primarily as home entertainment

playback systems (as opposed to recording systems, although the latter had recording capability); and all three failed. RCA abandoned its experiments in favor of a video disc; the CBS system, which relied on mini-movies on film with magnetically recorded soundtracks, ran into quality problems; and CartriVision never actually got off the ground, even though Sears ran full-page advertisements for it in Chicago newspapers.

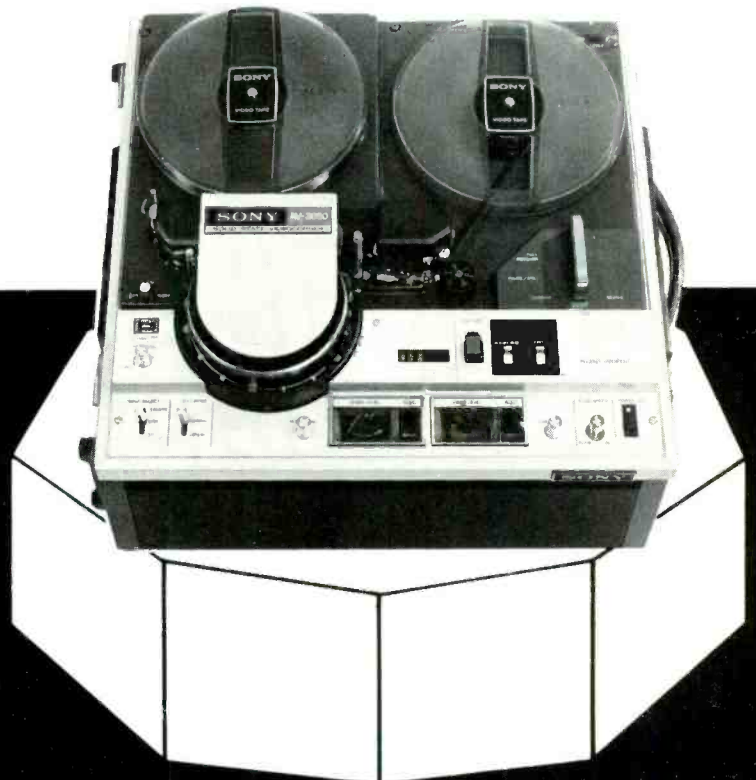
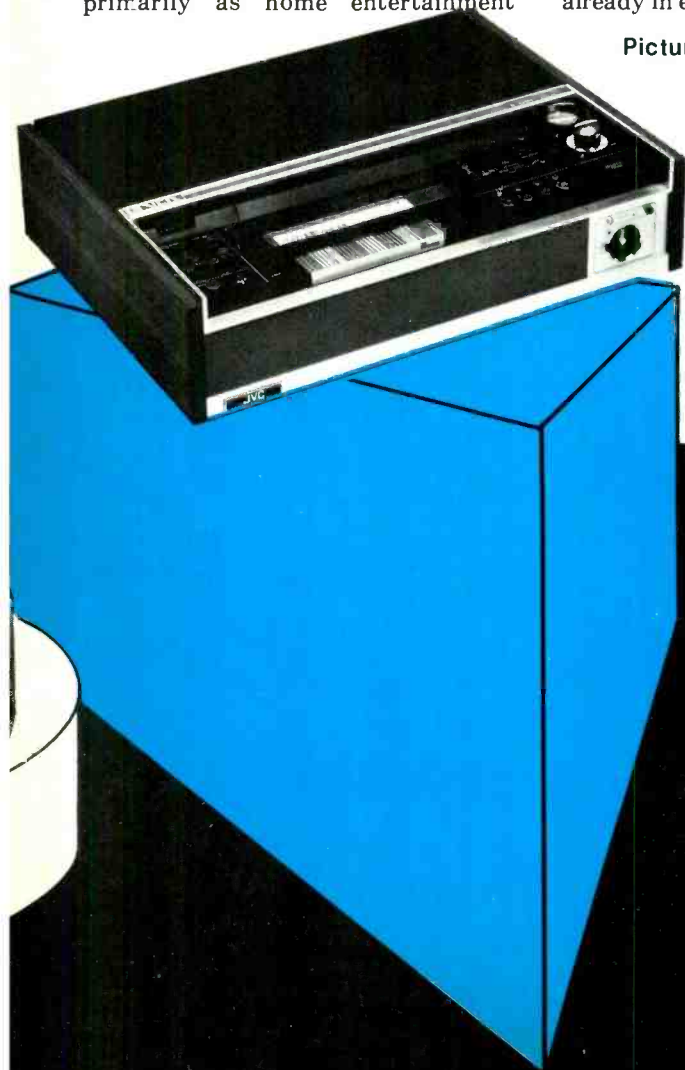
As 1976 draws to a close, TV addicts with enough money to find alternate program sources to the networks and independent stations face the prospect of two choices, the same choices which face the man who's buying a home music system for the first time. On the one hand, there's video tape, a medium already in existence which permits you

to record your own—either off the screen or with the aid of a closed-circuit camera.

There are a limited number of commercially recorded programs, but their cost is high. A complicating factor is the number of formats: whereas the audio buyer may select from cartridge, cassette or open-reel, the videotape buyer may choose cartridge, cassette or open-reel in a dizzying variety of tape widths and speeds. Until there's standardization among the equipment manufacturers, potential program producers vow to hold off committing to any particular system or systems.

The result is that the few programs now available for any of the systems are primarily instructional—sales-training seminars, lectures by orthodontists on bone graft, or porno flicks

Pictured: (Upper left) Cuing the Philips/MCA Videodisc System. (Bottom, left to right) Panasonic NV-5120 Video Cartridge Recorder, RCA "SelectaVision" VideoDisc player, JVC CR-6300U Video Cassette Recorder, Sony AV-3650 Open-Reel Videocorder.



(the latter are said to be big sellers to motels with closed-circuit television systems). Nonetheless, packagers hint at the prospect of feature films at prices of \$30 or less as well as a wide range of instructional, educational and entertainment short subjects.

Leading Videotape Systems

The three leading systems are U-Matic and Betamax, both developed primarily by Sony, and half-inch video cartridge. In addition, there are at least three noncompatible video systems, from Akai, Panasonic and Sanyo. Although at one time or another all have been talked about in terms of home entertainment, only the Akai, Sanyo and Sony Betamax systems currently fit in that category. The hardware for all three is comparatively inexpensive and the fidelity—both visual and auditory—is below that deemed satisfactory for broadcast or business use. The cost of tape also is significantly less—\$11.95 for a 30-minute Betamax cassette vs. \$22.95 for a 30-minute U-Matic cassette or \$15.95 for a reel of half-inch video tape 30 minutes in length.

Perhaps a better way of looking at the various systems is in terms of fidelity and color. Betamax, the newest home system, is all-color. It boasts audio frequency response of 50-10,000 cps with audio distortion less than 3% and signal-to-noise ratio better than 43 dB. Color picture resolution is better than 240 lines, at least as embodied in the SL-7200 recorder deck (\$1260). Tape width is half-inch and speed is 1.6 inches per second, yielding a maximum recording time of 60 minutes at a cost of \$15.95.

Sony's other format, U-Matic, uses three-quarter-inch tape at a speed of 3¾ inches per second. It boasts 60 minutes recording time at a cost of \$35; color resolution better than 240 lines, audio frequency response of 50-12,000 cps with signal-to-noise ratio better than 40 dB (as embodied in JVC's CR-6300U recorder/player, \$1960). A JVC color player only costs a mere \$1100. Typical of video cartridge hardware is Panasonic's NV 5120, which operates at 7½ inches per second using half-inch video tape. Audio frequency response is 50-12,000 cps with signal-to-noise ratio more than 42 dB and color resolution better than 240 lines. Maximum recording time is 30 minutes.

The newest videocassette system is

Sanyo's V-Cord II, which uses a two-hour color cassette costing \$19.95. The recorder, which uses half-inch tape at a speed of 2.91 or 1.45 inches per second, costs \$1250. It boasts horizontal resolution of 250 lines, audio frequency response of 80-10,000 cps \pm 6 dB, with signal-to-noise ratio of 40 dB. The cassette is comparable in size to an eight-track audio cartridge.

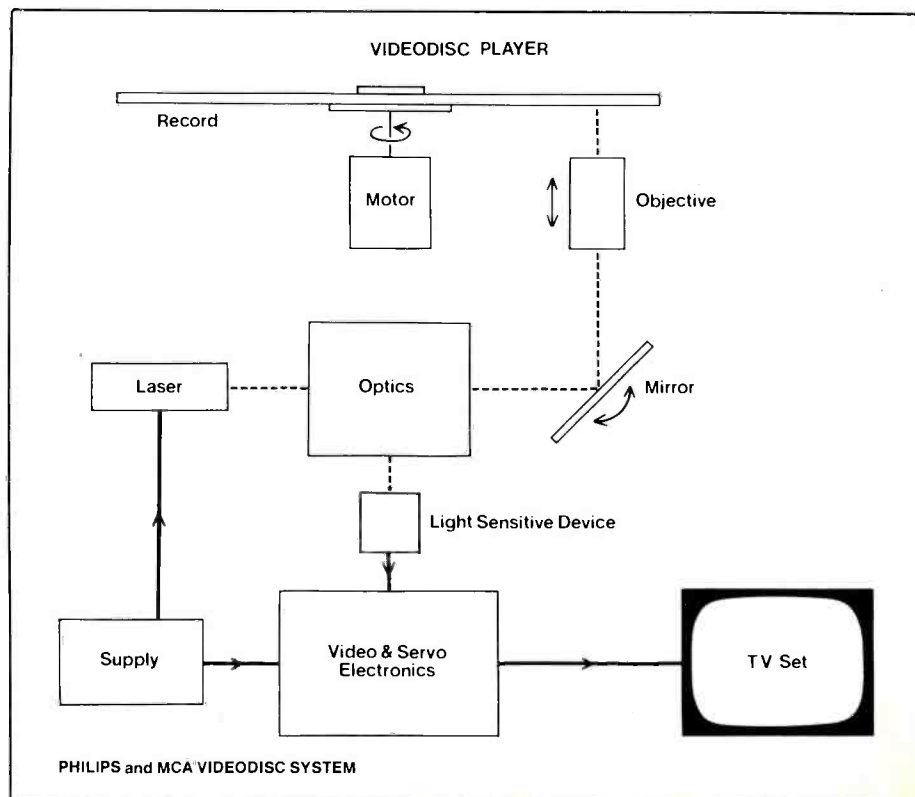
Then there are the open-reel recorders. Sony's 7½-inch ips half-inch black & white model, AV 3600, sells for \$895, while a color version, with electronic editing, is a mere \$2750. JVC and Panasonic offer similar models, all conforming to Electronic Industries Association of Japan standards. Akai's open-reel models use quarter-inch tape at a speed of 11¾ inches per second; a basic color AC-DC recorder sells for \$6995; black & white for \$1395. Thirty minutes worth of tape for the Akai system sells for \$5.95 black & white; approximately \$8 for color. Obviously these prices aren't designed for the average home. Equally obvious, as long as there are almost as many systems as there are manufacturers, videotape is going to have trouble getting off the ground as a consumer medium.

The Videodisc System

The videodisc faces somewhat the same problem. In the United States,

two manufacturing groups—MCA/Philips/Magnavox and RCA—have announced plans to have a color videodisc on the market within a year. In Europe, Telefunken/Decca already has one which is not compatible with either of the American systems, or with the NTSC color system used by American broadcasters. The MCA/Philips/Magnavox system is by far the more sophisticated of the American versions; RCA's uses hardware which is very similar to good audio equipment and which should be much simpler to make. The Philips system, for example, uses a laser instead of a conventional stylus to track its record grooves. RCA uses a conventional stylus and cartridge assembly to track the record and an electron beam to play the program. Philips uses only one side of the record, putting 30 minutes of programming on a 12-inch disc. RCA gets the same playing time per side, but uses both sides. Both companies promise programming at the rate of \$10 an hour, or about \$18 for a feature movie. While RCA's disc turns at the relatively high speed of 450 rpm, Philips' disc revolves at a breathtaking 1800 rpm in a completely enclosed turntable.

The videodisc offers some distinct advantages over videotape. For one thing, it's cheaper—both Philips and RCA promise playback systems in the \$500 range. For another, both com-



panies already are in the record business, and both have access to enormous libraries of program material of all descriptions.

The MCA disc actually is clear plastic, coated with aluminum. Because Philips/MCA uses a laser beam instead of a stylus, there is no record wear. MCA claims that the laser will overlook such surface imperfections as fingerprints and scratches, something RCA's stylus and electron beam can't do. Another advantage of the MCA system is that, like the more expensive videocorders, it can speed up or slow down the action, or even stop a single frame completely. The Philips system with its laser is referred to as an optical system; the RCA, which uses a stylus in much the same manner as a record player, is a capacitance system (the stylus creates tiny changes in electrical capacitance within the body of the playback cartridge).

Disc-cutting with Beams

When you look at a freshly-pressed Philips or RCA videodisc, or freshly cut master, you don't see a continuous record groove. In fact, unless you look very closely indeed, you don't see anything at all except a highly reflective flat surface. Instead of using a conventional disc cutter, both systems use beams to etch out thousands of tiny holes in the mirrorlike surface. Each hole represents a bit of electronic information. Together, they enable the playback device to recreate the original picture and sound track, complete with proper colors and tints.

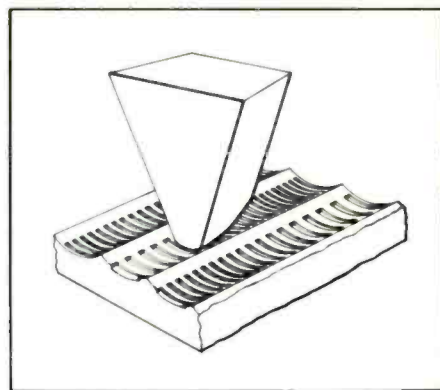
Philips uses a laser beam to etch its holes; RCA an electron beam. All of the Philips holes are of the same width

and depth, but their length varies, while RCA's holes vary in depth. In both cases, it's possible to electroplate the etched master disc and to press copies from it, just as it's possible to press audio discs. The major difference is that since both the RCA and MCA systems depend on reflective light for playback, it's necessary to include some highly reflective backing for the recording. In RCA's case, it's two-faced and placed in the middle of a two-sided record, while Philips places it on the bottom of the videodisc biscuit.

With the exception of the metalized backing and the fact that there's no carbon blacking in the vinyl used to press the records, videodisc pressing is very similar to the manufacturing of audio discs.

Because of the high speed of both discs, it should be possible to record the full audio spectrum with no difficulties. In fact, by using digital sampling or multiplex techniques, it should be possible to include two or four channels of sound in addition to a frequency response of 20-20,000 cps or more. As a practical matter, however, early demonstrations left something to be desired in terms of sonic quality. The reason, according to an RCA engineer: "We wanted to demonstrate the picture quality we could achieve. If we can get that kind of quality and that degree of color accuracy, then good-quality stereo sound should be no problem." A Magnavox spokesman suggested that most viewers aren't really interested in good sound anyway, and that if it were required, Philips would deliver it.

Although the RCA disc rotates at a speed of 450 turns per minute and the



Model of RCA Videodisc surface and tip of stylus riding in the groove.

cartridge is required to reproduce the very wide bandwidth of color TV, the various components are well within the capability of existing technology. In fact, the turntable used by RCA for a press demonstration earlier this year was merely a jazzed-up version of a commercially available made-in-Japan single-play audio turntable. The Philips disc rotates at 1800 rpm, making much greater demands on the player; and its laser playback system has yet to be mass-produced. An MCA vice president, John Findlater, says that Philips can produce the lasers for as little as \$10 to \$15.

Then there's the Teldec TED player, developed jointly by Decca Record Co. of London and Telefunken GmbH in Germany. It's been on sale in the latter country for approximately a year at a price of \$650 for the player, with records selling from \$4.30 to \$11 for a complete program. Like the RCA system, it uses a stylus. But unlike RCA, its discs play for only ten minutes each, requiring an album for a complete program. Program material

HOW THEY COMPARE

	Sony Betamax	U-Matic	Video Cartridge	Sanyo V-Cord II	Philips/MCA Videodisc	RCA Videodisc
Player price	\$1260	\$1800	\$1600	\$1300	\$500	\$500
30-minute program cost	\$12	\$23	\$30	\$5	\$10	\$10
Availability	Limited	Now	Now	Late 1976	1977, limited	1977-1978
Recording System	helical scan	helical scan	helical scan	helical scan	laser beam	electron beam
Tape or disc size	½-inch magnetic tape	¾-inch twin hub	½-inch single hub	½-inch cobalt-doped tape	8-inch or 12-inch aluminum-coated plastic	12-inch vinyl disc coated with metal
Speed	1.6 ips	3¾ ips	7½ ips	1.45 or 2.91 ips	1800 rpm	450 rpm
Life Expectancy	NA	NA	NA	NA	unlimited	500+ plays
Maximum playing time	60 min.	60 min.	30 min.	2 hours	30 min.	30 min. per side (2 sides)
Manufacturers	Sony	Sony, Panasonic, JVC, Norelco	Panasonic	Sanyo	Magnavox	RCA

is somewhat limited, and sales so far have proved disappointing. Therefore, the manufacturer is reported to have suspended production temporarily.

Industry Opinions

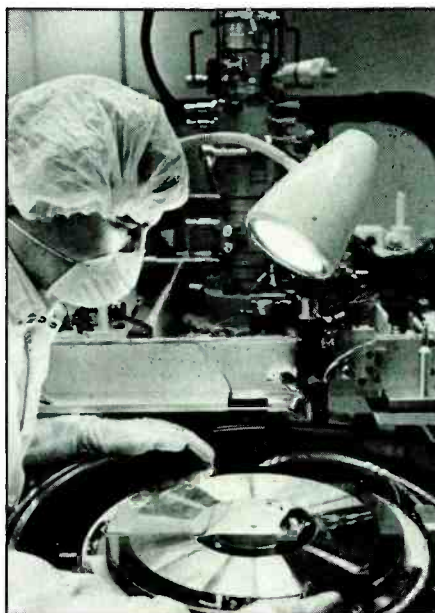
That fact—and the inability of earlier home video systems to gain a popular foothold—is not lost on the people who are making and who plan to sell the systems when they become available. Yet virtually everybody in the home entertainment business is convinced that some form of home video programming is inevitable, that it will be available in the foreseeable future, and that the public will flock to it.

People who think seriously about the home entertainment business—like Peter Goldmark of Goldmark Communications, the man who invented Columbia's EVR system and whose consulting firm is now a subsidiary of Warner Brothers; like Henry Kloss of Advent Corporation; and like Sony's new deputy president, Norio Ohga—are convinced that component television will be to the 1980's what component hi-fi was the the 1960's. Advent and Sony already are heavily involved in the concept with projection television systems which are to television what the corner horn and acoustic suspension speaker systems were to radio and the phonograph. Sony and JVC are only two TV set manufacturers who currently have the capability to produce "hi-fi television"—sets with sensitivity great enough to pull in weak, distant signals, just as the first FM tuners were able to do with distant FM stations. And in addition to the videodisc and videotape, there are dozens of companies scrambling for a share of the video-games business, this season's electronic toy.

But when it comes to providing programming specifically for video, there's been surprisingly little thought. RCA and MCA, like CartriVision, Teldec and others before them, have turned naturally to movies as a staple in home entertainment—and MCA's subsidiary, Universal-International, has agreed to make its catalogue available. So have a number of independent producers. But the question of whether the public is willing to spend anywhere from \$14 to \$30 for a video recording of *Earthquake* remains to be resolved. Likewise, there are hundreds of educational or self-improvement flicks around—Arnold Palmer to help you improve your golf

swing; stock analysts to counsel you on the Market. But similar material has been available on records for years, without making it to the best-selling charts. Culture vultures have high hopes for the plays of Shakespeare, the Bolshoi Ballet or the Metropolitan Opera on video—and all of these already exist on tape.

Peter Goldmark cautions that the old formats and the old programs may not be what will sell. "This is a new medium," he advised recently, "and will require new techniques and perhaps entirely new kinds of programs." If Goldmark has considered



Preparation for the electron-beam mastering of an RCA VideoDisc.

the question, the people most likely to provide the programs don't seem to have. "If we're asked to provide a program for video distribution, we will," said a spokesman for Paramount. Will it be filmed or shot on videotape? "I assume we'd shoot it on film, using our existing facilities and labor. If it's going to be transferred, that would be done at a later stage in a laboratory. We don't have anything to do with that."

The Union Question

The spokesman went on to explain that the question of union jurisdiction on home video presentations has yet to be worked out. "There is a problem between the film unions and the video technicians. We had an incident where the entire film camera crew walked off the set when a video technician showed

up. Obviously, we can't have much of that." Similar union problems confront the agriculture expert who steps before a film or video camera to record a lecture on how to grow bigger and better tomatoes in your home garden. "I think we'd handle that by insisting that he get union scale for his appearance, and that one of our members be present on the set," said a source at one of the talent unions. But which union—the Screen Actors' Guild or the American Federation of Television and Radio Artists? "Depends on who's doing the shooting," said the source. "If it's a film studio, chances are it would be Screen Actors' Guild. If it's being videotaped, it'd be AFTRA."

The spooky thing about home video is the way everybody avoids talking about the question of union jurisdiction. In preparing this report, I found engineers and technicians frank in discussing the merits and demerits of their own systems, details on how each system works, and of corporate executives on corporate plans and policy. But when the question of unions came up, the answers became evasive and long-time friends asked to be allowed to break off interviews or to go off the record.

As a practical matter, most packagers seem to be avoiding the union problem by dealing with existing material—feature films from Universal, 20th Century Fox or Paramount; instructional films shot for nonprofit exhibition; or material on which there is no union problem (travelogues and the like). In addition, some are shooting their own videotapes using non-union cameramen and performers. Skin flicks and instructionals usually fall in this category. But that leaves unanswered the question of availability of a large amount of material ideal for home video but embroiled in union problems: Public Broadcasting's "Live at Lincoln Center" programs, a performance of the Bolshoi Ballet shot for RKO General's defunct Pay TV experiment, Metropolitan Opera performances videotaped for showing in Japan. What will happen to these and other programs is a question nobody seems willing—or perhaps able—to answer.

Home video programming *does* seem more certain and more imminent today than it has in years. But just when it will arrive, what form it will take, and whether the public reaction will meet the high hopes of its backers remain to be seen.



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By Veda Neu Solomon

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A SESSION WITH JUDY

A beautiful day in May. The epitome of New York springtime. One of those rare days when you feel you must be out of doors, playing in the city. And yet, when Judy Collins appears in Studio A-1 at A & R Recording Studios, she brings the sunlight in with her. Accompanied by her son, Clark Collin Taylor, Judy greets a control room uncommonly filled with people. She raises her hands in a collective wave that takes in friends and associates, including her producer, Grammy Award-winning Arif Mardin, and engineer Phil Ramone, a notable name in recording. She carries a sprig of lilac and wears a shawl as if coming in from a country walk. And yes, friends, her blue eyes *do* sparkle as they did staring out at you from her twelve previous album covers. Judy loves to record and although there is

some tension in the air you feel that everyone here is comfortable and ready to work.

On this particular day, Studio A-1 is seeing a lot of action. It is rather a special day because the basic tracks being done are for the single truly orchestrated song on this new album. This session looks anything but basic, what with 13 union musicians tuning up to play their parts in the haunting melody "King David," written by Walter de La Mare and Herbert Howells. There are eight cellos, two upright basses, two harps and a flute—an odd mixture for a musical arrangement, but one that is particularly effective for this biblical melody.

The room itself is quite large and reminiscent of a sound stage. There are even scenery backdrops in one corner behind the set-up. Phil Ramone moves through the musicians, rechecking mic angles and distances, although his assistants are there to do it. He, like the others involved here, knows what he wants. In this session, the cellos are "close-miked" with Neumann U-87's or 67's to enhance the rich quality of the instruments. Each mic is approximately 14 inches from the sound hole to pick up some of the resonance of the cello. Two Sennheiser

JUDY COLLINS

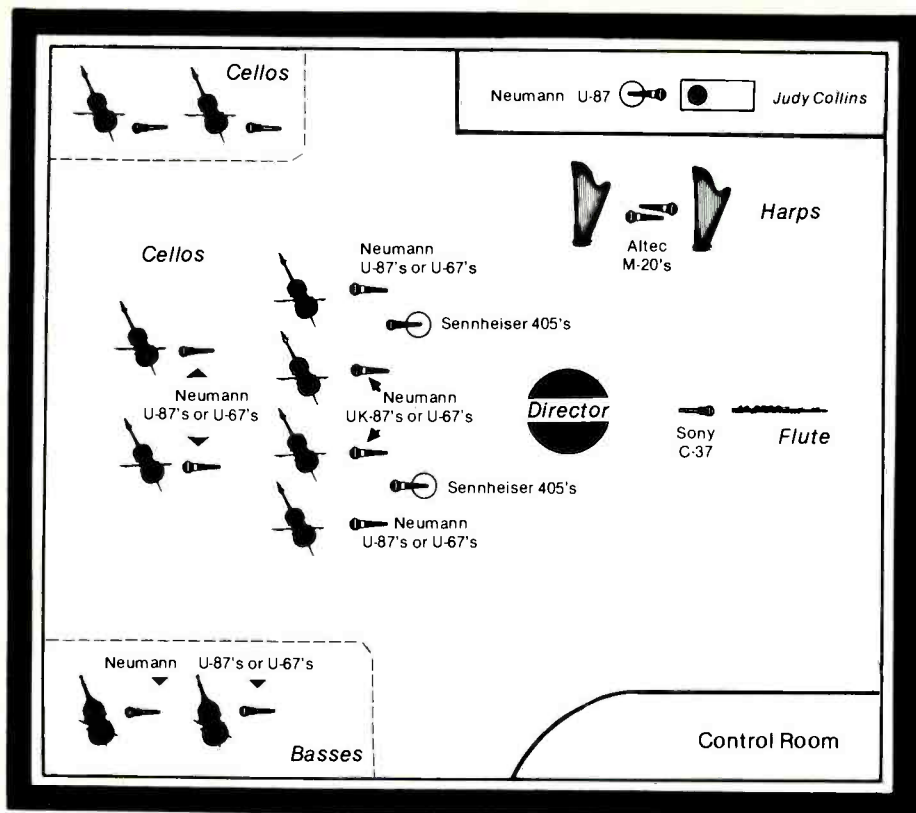


W
Y
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405's are used as overheads to add room presence to the already full quality. The two upright basses are located to the right of the string players (see diagram on page 40), also miked with U-87's placed about a foot from the F-hole of the instruments. Approximately 20 feet to the left of the cellos are the harps. Both have small Altec "lipstick" mics placed inside the sound boards to allow for almost total separa-

tion and the least possible leakage. However, due to malfunction in one of the "lipsticks," one of the harps is remiked with a Neumann U-67. This does not alter the fragile quality of the harps, but engineer Ramone finds additional leakage to be a problem. The problem is later remedied with the discovery of a simple bad cable, and Phil returns to the "lipstick." About 35 feet across from the strings sits the lone flute, with a Sony C-37 condenser mic positioned one-and-a-half feet from the mouthpiece of the instrument.



View of A & R Recording Studio layout, with instrument location, mic selection and placement during recording of the "King David" track.

The Perfect Arrangement

Finally, at the hub of all this activity, on a platform stands the maestro, Jonathon Tunick, a soft-spoken gentleman whose reputation is almost as great as his arrangements. He is the man who has orchestrated musical scores for composer Stephen Sondheim and this season's Broadway hits, *Pacific Overtures* and *A Chorus Line*. He also arranged three of the tunes on Ms. Collins' most recent album, *Judith*, including her beautiful rendition of Sondheim's "Send in the Clowns."

As you hear the first practice strains of "King David," you realize that Jonathon has made an already lovely melody move. He has created an atmosphere in the studio that makes onlookers lower their voices and direct their attention to the thick glass windows between studio and control room. "The perfect marriage" is what Judy calls his orchestrated blend of melody and biblical words. Jonathon himself speaks of his concept of King David's melancholy in this way: "I try for the feeling not only of a character and his emotions, but [we] try to give it an atmosphere, . . . one that is descriptive and biblical."

In speaking of his relationship with

Ms. Collins, Jonathon provides an insight that could be thought predictable: "Meeting Judy is like meeting her music." He says of their relatively short alliance, "Everything flows when we record." Jonathon also finds working with Judy enjoyable because "She's not content to remain the same—she expands with the music." Surely this is the mark of not only a veteran singer but a musician who is interested in every aspect of recording her albums. And, as an observer, you can see by the way they work together—Collins going over the lyrics and interpretation, while Tunick directs the musicians in runthrough readings—that Judy and Jonathon are compatible in their work.

Artist and Producer

Of course, people who work well together make for a relaxed yet productive atmosphere and we see this also in the relationship between artist and producer.

Arif Mardin is a name that you should be familiar with. Since joining the Atlantic Recording Corporation in 1963, Mardin has produced and/or arranged approximately 80 albums for at least 40 artists. It is difficult to keep track of him as he travels from coast to

coast and sometimes works on a number of projects at the same time. People in the music industry marvel at the versatility that becomes apparent with his list of credits. He has been awarded a number of gold records that include work with Aretha Franklin, The Rascals, Brook Benton, Roberta Flack and Bette Midler.

Perhaps the most amazing quality about Arif Mardin is his ability to arrange and produce the most varied types of music. His educational background includes a B.A. in Economics, a jazz scholarship from The School of Jazz in Lenox, Mass. and the Quincy Jones Scholarship to Berklee School of Music, Boston, 1958. He also taught at Berklee in 1960 and 1961. Possibly these experiences contribute to the talent he puts into his work with such groups as The Average White Band, The BeeGees, King Curtis, Hall and Oates, Herbie Mann, Elvin Jones, Eddie Harris, Les McCann and countless others. This wide spectrum also includes such female artists as Petula Clark, Jackie de Shannon, Laura Nyro, Lulu and the ever-smooth Carmen McRae. Mardin is a producer who believes "Trust must not be betrayed. . . . The artist is who you are working for." This attitude and the man's extraordinary talent may be two of the reasons he works so much and so well.

His relationship with Judy Collins was "born" on the *Judith* album. "Judy had been quite touched by the death of the Duke . . . Ellington. She had written 'Song For Duke' and friends had directed her to me. . . . It was important to her that the arrangement be right." Arif feels that "Knowing Judy allows for understanding her—it creates a bond." The feeling appears to be mutual. Of working with this charming man Judy says, "It's a dream. . . . He is totally competent and has a vivid imagination. . . . He can work in any area." Perhaps this quality of mutual respect and desire to say something meaningful is the reason they work so well together.

His relationship with Judy Collins was "born" on the *Judith* album. "Judy had been quite touched by the death of the Duke . . . Ellington. She had written 'Song For Duke' and friends had directed her to me. . . . It was important to her that the arrangement be right." Arif feels that "Knowing Judy allows for understanding her—it creates a bond." The feeling appears to be mutual. Of working with this charming man Judy says, "It's a dream. . . . He is totally competent and has a vivid imagination. . . . He can work in any area." Perhaps this quality of mutual respect and desire to say something meaningful is the reason they work so well together.

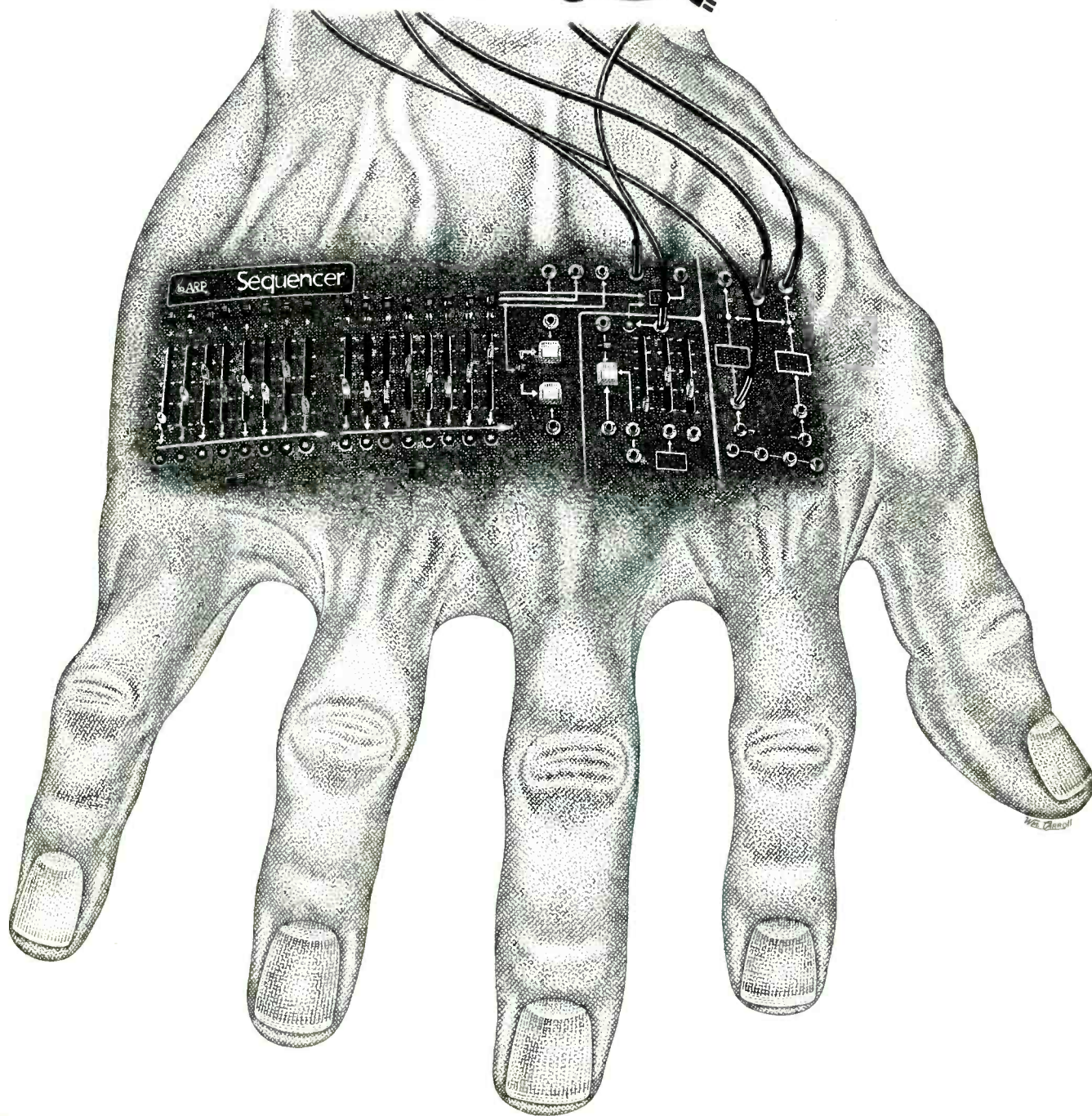
The Session Begins

On this day, they consult each other only when there is something definitely in question; otherwise, the two already seem to know what they want from the session without constant discussion. Neat and precise, you think as you watch the session begin. Arif takes a seat out in the studio for the first take, Judy takes her place in a

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vocal booth and Phil Ramone sits down on a high stool behind the 24-track Audio Designs console.

The console sits prominently in a large, rather unadorned control room. No plush carpeting or elaborate wall covering here, but this room is functional. At this time, the console has 32 inputs, 24 out; however, expansion for more versatility is around the corner. In the place of VU meters is an Audio Designs Vue-scan (utilizing a Setchell-Carlson monitor) which can be calibrated to average, peak and plus-10. Track assignment is done through an Aud-X Relay. The monitoring system consists of two Altec 604 E's and two Big Reds, which are actually modified 604 E's with a Mastering Lab crossover. They are being powered by McIntosh amps. E.M.T. reverberation units are used for echo. And, completing the system is an MCI 24-track machine, Ampex two- and four-tracks and a 24-track Dolby unit. Sophisticated and useful. Although this room lacks the embellishments found in some New York studios, the grandeur remains in the quality of the sound.

Judy is in the vocal booth now, using a separate cue system which enables her to hear directions from Jonathon.

In front of her is a Neumann U-87 condenser mic that provides a fairly flat frequency response which allows true vocal tone. Phil believes in the "natural sound." Consequently, he does not limit Judy's voice during the actual recording, although he may use a limiting technique in the mixdown. From such previous endeavors as Paul Simon's *Still Crazy After All These Years*, Burt Bacharach's *Living Together* and Phoebe Snow's *Phoebe Snow*, we find that Phil consistently produces a clean, precise yet mellow sound.

And so the composition of melody, arrangement and artistic interpreta-

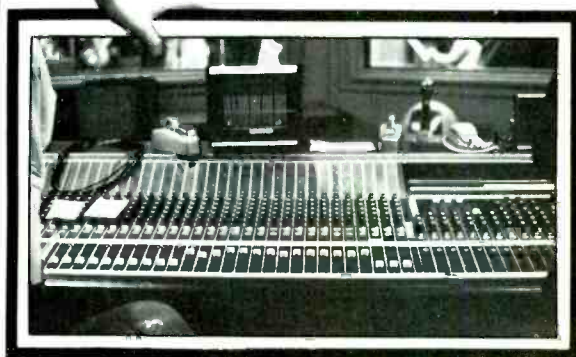
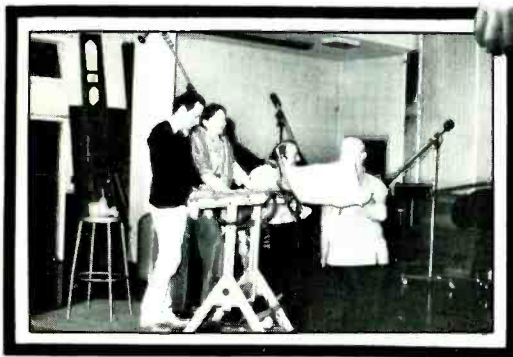
tion begins ... and we listen. As in most "live" sessions there are only a few stops and starts. After Take 3, Judy comes in to the control room to listen back and you realize how demanding she is—of herself. The knowledge that she can go back into the studio and redo the vocals alone and in possibly a more conducive atmosphere does not affect the fact that she and Arif would like a "100% perfect" interpretation. Collins looks for clarity. She wants the meaning of the words to be evident to the listener. That is why she works "infinite hours" on each song, until she becomes "intimately familiar" with each theme and idea.

Takes 4, 5, 6... Clark, a young man seemingly unspoiled by his mother's fame, makes a comment to Arif: "Mother wants to be sure all the words are understandable," and the producer sits him down at the console telling him to mark each place in the score where it is difficult to comprehend a word. By this time, though, you are becoming increasingly familiar with the words and you hum the first line as Judy's clear voice begins again:

King David was a sorrowful man
No cause for his sorrow had he
And he called for the music

(Below, left to right) Jonathon Tunick, Judy Collins, Arif Mardin and session cellist. (Bottom) Assistant Vicki Fabry checks a console setting for producer Mardin.

(Below) The A & R Recording Studio console. (Bottom) Producer Mardin (left) consults the score, as arranger Jonathon Tunick leads the instrumentalists.



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FUJI FILM

THE TAPE THAT'S HEARD AROUND THE WORLD

CIRCLE 77 ON READER SERVICE CARD

Of one hundred harps
To ease his melancholy.

This session flows. Quoting the union contractor, Paul Gemignani, "The musicians here are the top recording people in the city." Most are familiar with Judy, many having played on her last album. On their required breaks they drink coffee and listen; it is surely hard not to.

Time to Relax

The session for recording "King David" has taken two hours, and now the vocalist has time to relax, while for the next half hour producer Mardin devotes time to "sweetening" the tracks for "Come Down in Time." He is directing the addition of strings to the basics, and Hugh McCracken will come in later to overdub a lead guitar line.

Due to the work and commotion involved, a recording session is a strange forum for an interview, so we stick to the theme as closely as possible. Probably the question most asked of an experienced entertainer and recording artist is, "How much say do you have in the final product?" Judy attends all sessions having to do with her music. She plans, watches and comments on every aspect.

All of the material on this new album has been written and introduced to her by others. From the elegant and classical "King David" to Elton John's "Come Down in Time" to "Take This Longing," a song written by her old friend Leonard Cohen, she reaches for a wide audience spectrum. The appearance of a song by a late Chilean activist and the title song from the album, "Bread and Roses," prompts Judy to remark that she believes social statements take place when there is the necessity for them: "If the material is good and says something, it is important." "Bread and Roses," written by Mimi Farina, is a song referring to the Women's Movement and first recorded in an old stone church in Manhattan. Judy loved that experience, but upon later discussion, plans changed and the basic tracks were redone in the studio. Perfection is not easily come by.

On commerciality, a much-discussed prerequisite for artists in today's music industry, Judy says, "Commerciality is not a bad word. . . . It is very important to be able to do all of it." Along these lines she expresses ". . . surprise when 'Amazing Grace' be-



came a top-40 hit." Any number of the songs on *Bread and Roses* could follow that example.

Judy finds it easier to "feel" a song written by someone else. In this way, she has started many singer-songwriters in their own careers. (Remember Joni Mitchell's "Clouds"?) Her original tunes are usually "more difficult," perhaps because they are so profound and she is so close to them in reality. Judy Collins is a lady striving for high goals. With the exception of "King David," the musicians on this album are people she has worked with often—studio musicians like Hugh McCracken, Steve Gadd and Tony Levin. They, like Judy, get involved in the music and, from Arif Mardin's point of view, ". . . are like a family and play well together." Judy works with everyone because it is "necessary and productive communication."

If and when Judy does go back into the studio to redo vocals, she prefers closed sessions. As with most vocalists, she wishes to be relaxed, and finding this mood sometimes takes solitude. The cast on these days consists of Phil, Arif and assistant, Vicki Fabry. No friends or press on these sessions—just Judy out there in the

darkened studio with one pink light framing her face. She is a little older than you may remember her, the voice a touch more husky and mellow, but her high notes are still bell-like and her interpretations still memorable. She doesn't use her old acoustic guitar anymore. "I had to practice all over again to play on one tune on this album." She expressed herself by wrinkling her nose and uttering a sound similar to "Yich!"

In writing about a single vocalist—one who has been around for a long time and has great experience in performing and recording—we find an almost simple theme: Do it right, do it well, do it quickly while enthusiasm still abounds. *Judith* took almost seven months of hopping in and out of the studio—a frustrating experience for Judy Collins. This new album is scheduled to take two months, give or take a few days while she does concerts and other creative endeavors. As for today, the session has clicked, the musicians are leaving on time, everyone is still smiling and chewing on the remains of Chinese spare ribs. Probably like all of the other days this week . . . productive, fascinating and professional.



THE COST/PERFORMANCE EQUATION: HOW MUCH TAPE RECORDER IS ENOUGH?

Essentially, a tape recorder is a machine you can use to capture your talent and faithfully reproduce it. Practically, the more you make demands on a tape recorder, the more demands it can make on you.

Put another way, a tape recorder can be your wings or an anchor. It can work for you or it can work against you.

At \$1,299.95 the investment you make in the Dokorder 1140 gets you a partner instead of a handicap. Compare what it does to what it costs and you won't find a better tape recorder anywhere.

The 1140 lets you concentrate on your music as art. Much of the concern you have about your music as signal is handled for you automatically.

The 1140 has logic circuitry that takes care of getting you in and out of Sync and in and out of Source automatically. It makes knowing where you are in multi-track recording a whole lot easier.

The 1140 also has an automatic cue-up function, called Program Memory. Once it's set up, the Pro-

gram Memory automatically brings you back to the beginning of material and either stops or plays it again, depending on what you tell it.

The transport controls on the 1140 are digital logic-operated so you can go from one mode to another directly except in Record and there is a motion sensing system which lets you go into play from fast forward or rewind when the reels stop.

Bias controls are up-front on the transport and there is a built-in pink noise generator which supplies a test signal to each channel. This unusual device makes biasing simple but extremely accurate.

There is a lot more hardware to the 1140: peak level indicators, discrete playback and record amplifiers, 62-Volt record drive circuit, wide band sync response, etc.

All to make it easier to put music on tape.

DOKORDER 1140

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CIRCLE 78 ON READER SERVICE CARD



P.A. PRIMER

A GUIDE TO
SOUND
REINFORCEMENT

PART III

Introduction

Part 3: *The first two parts of the Primer, which covered basic information on P.A. design, appeared in the June/July and Aug/Sept issues of MR. This part completes the information section and concludes with a sound reinforcement saga which we have constructed specially to demonstrate the problems which can occur in a typical P.A. situation.*

The Main Speaker System

The main speaker system is the most difficult portion of the sound system to make perfect. A good-sounding set of speakers is the key to a good-sounding system, and no amount of electronics or gadgets will make up for bad speakers. This means that the very best speakers available must be used. They must be chosen exactly and put together with the utmost precision.

The major speaker fundamentals and basic sound theory discussed in Part I should make it easy to build a top-quality speaker system. Unfortunately, there are hundreds of speakers, boxes, horns, drivers and tweeters to choose from which are built by at least 30 different manufacturers. Also, at the present, there is practically no concrete scientific in-

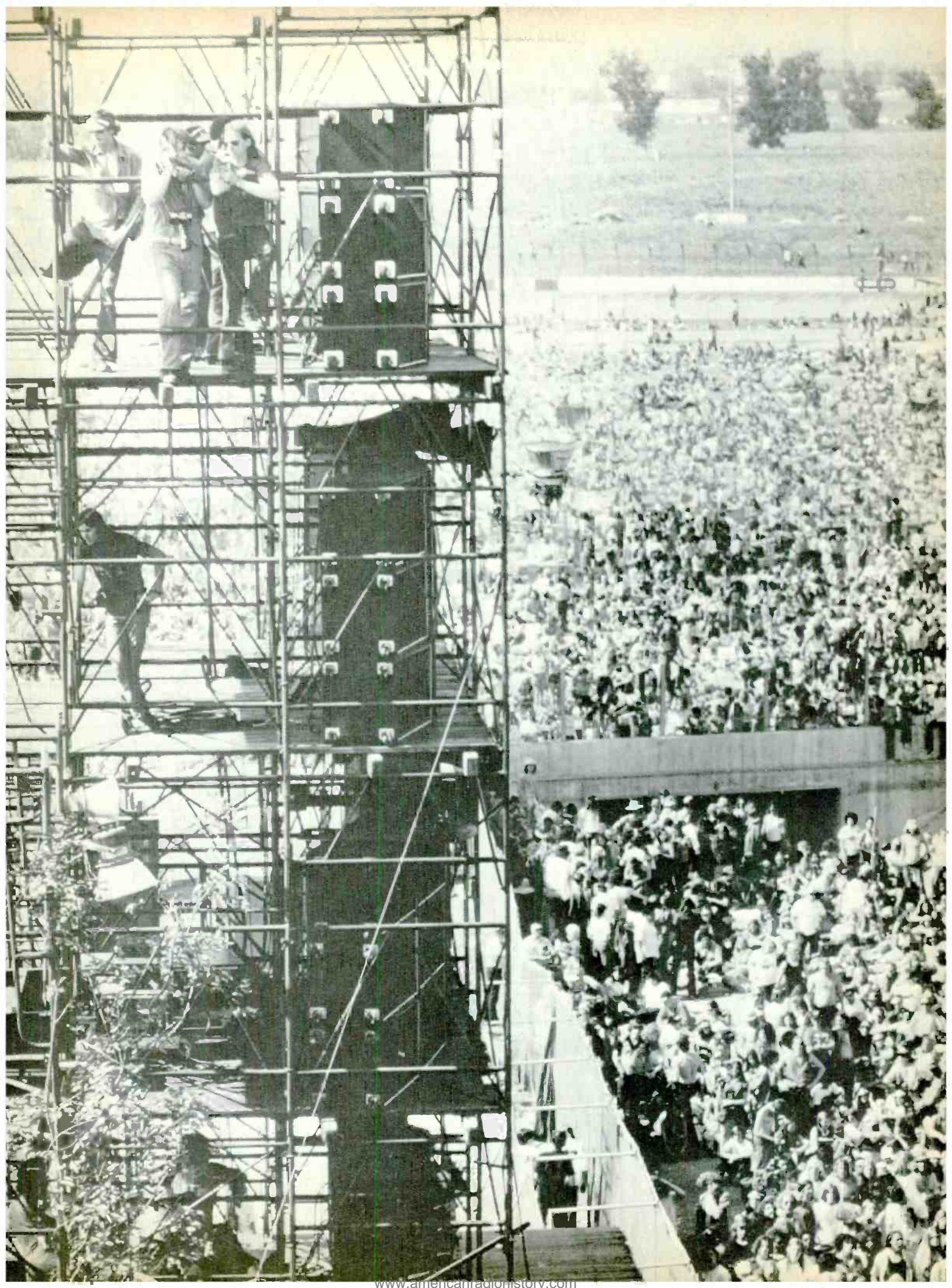
formation about the different configurations of these systems when operating in big rooms. Taking the specifications of a bass box and a horn may look good on paper, but put 20 or 30 of these units into an arena with 10,000 people and see what you have. A mess! As a result, all sorts of combinations have been tried, and the majority of the results are not very pleasing.

It has been common practice for a sound company to randomly stack up a pile of speakers and horns on both sides of the stage and then let it rip. Part of the problem has been the lack of time. Most one-night shows only have four to six hours to set up the entire sound, light and stage system. Although this makes the situation seem out of control and hopeless, a few of the top concert sound companies are dedicated to solving these problems and increasing the quality of concert sound. It is quite obvious that concert sound reinforcement has a lot of room for improvement.

Now that all the problems have been pointed out, it is still a fact that the speaker system is by far the most important element. How is a set of speakers chosen? Well, on the bass end, the possibilities for the speaker enclosure include the infinite or sealed box, the bass reflex box, the bass horn, the folded bass horn, or a combination of the above. As for a speaker to put in

By Jim Ford and Brian A. Roth

Drawings by Steffon A. Kachocki



The \$900 Sony Turntable.



Study this page, because we don't want the price to suck you in.

It would be a shame.

People responding to something because it costs \$900*. Not because it's worth \$900.

People captivated by price, not performance.

We at Sony don't want anyone spending good money for a great turntable for a bad reason like an impressive price tag.

Especially because there's so much technology in the PS-8750 for you to fall back on. After you spring for the \$900.

So before you spend a lot of money on us, spend at least a little time with us.

Total speed accuracy is our speed.

Speed accuracy can be a problem for turntables because the stylus continually puts pressure on the record (and, in turn, on our engineers.)

In fact, as little as one gram of stylus pressure can cause a slow-down in record speed. A slow-down that is particularly noticeable in loud passages.

Up till now, most good turntables achieved accuracy with a direct drive motor and a servo-system to control speed variations.

It was fine for most people. And it still is.

But for those with more elegantly attuned hearing, it's just not good enough.

That's because the servo-system will not serve when it comes to small, low-frequency speed variations. It is not sensitive enough, and the result is there to be heard — if you have the discernment to hear it.

To get around this, Sony took the conventional servo-system and revolutionized it by adding a quartz reference and a phase lock circuitry.

That mouthful is really easy to digest. The stable quartz generator emits a constant frequency. Any variations in speed monitored by the magnetic head are converted to changes in the phase of the signal. This is then compared against the quartz generator's phase signal.

If they do not match, our Xtal-Lock corrects the speed variation instantly.

A conventional servo-system has to wait for the error to appear as a change in frequency, and then it takes time to correct it.

Sony can make the corrections 10 times faster. And within one cycle. All because Sony uses the phase difference as a source of information on speed error, rather than using the angular velocity.

Chart A dramatically illustrates the dramatic difference.

Why our tone-arm costs an arm and a leg.

After conquering the drive system, Sony sped along to the tone-arm. The problem: constructing a light, strong tone-arm that has a low resonance quality.

A high resonance quality means the tone-arm vibrates — performing a duet with whatever record is playing.

Sony wrestled with the arm problem and

ating both the drive system and the return mechanism. Meaning that the turntable is linked to the tone-arm. And very often, this linkage produces a drag on the arm.

The PS-8750, however, proves that two motors are better than one. The motor that runs the tone-arm is totally isolated from the other motor that runs the turntable.

This eliminates the drag, particularly the drag at the very end of the record.

This drag is really a drag, because the return mechanism is preparing to activate itself, and the friction is therefore increased.

Sony further innovates by designing pick-up and return cues that are optically activated. Like the doors in a supermarket, if you will.

With the PS-8750, you get the best of the direct drive manual and the best of the semi-automatic. With none of the worst of either.

Does your turntable give you bad vibrations?

The same sound waves that travel from your speakers to your ears also travel to your turntable.

This transference excites the equipment. Becoming acoustic feedback, or IM distortion. And the louder you play your record, the more of it you get. There's cabinet resonance. Caused by sound waves.

And there's something called record resonance. Caused by the friction of the stylus in the groove of a warped record.

Sony, however, deals resonance a resounding blow.

We have built the PS-8750's turntable base of an inorganic material that is acoustically dead.

We have also undercoated the platter with an absorbing material that prevents it from transferring any bad vibrations to the good vibrations on the record.

And we cut down on record resonance by pumping a silicone damping material into the record mat itself. By having contact with the entire record surface, it offers more support.

Not for people who want the latest. But the greatest.

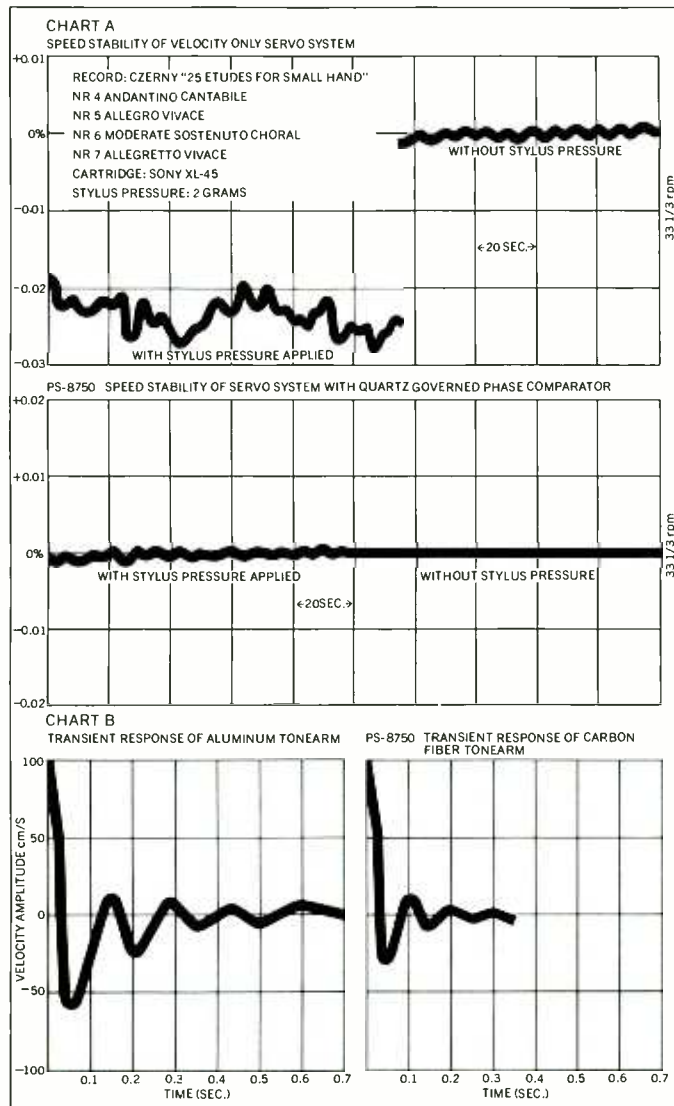
The PS-8750 represents a tonnage of innovation and a couple of real breakthroughs.

It is not for those who want to spend \$900 so they can say they spent it.

It is for those who want to spend \$900 so they can hear they spent it.

SONY®

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came up with a different material: a carbon fiber of enormous strength and equally enormous lightness. Moreover, it has a much smaller resonance peak than the aluminum alloy commonly used. (See Chart B, where the difference is demonstrated.)

The carbon fiber worked so well that it was even incorporated into the head shell of the PS-8750. But Sony didn't stop at the tone-arm's construction. Next came the actual operation of it.

Most turntables have one motor, oper-

*Cartridge sold separately.

the box, it will probably be an 8-inch, 10-inch or 12-inch woofer. In the midrange section, an 8-inch, 10-inch or 12-inch speaker in a sealed box or a short bass horn are the usual options. It is also possible to use a large horn and driver down to 500 Hz to cover the midrange. For high frequencies, the choice is often an 8-inch, or 5-inch speaker in a sealed box or a horn-and-driver combination. For the very top high frequencies, if they are to be reproduced, a super tweeter, a piezo tweeter, or a horn-and-driver combination may be used. Now all of these components may be mounted in one box, two boxes, three boxes or all in separate boxes. They may be stacked on top of each other randomly; or all the bass units may be stacked together, and then the midrange and high-frequency units stacked on top of the bass boxes; or the horns may be pointed in every direction and the bass units may aim straight out; or the whole system may be bolted together and hoisted into the air. Well, there must be at least 10,000 different possibilities and no one perfectly correct answer.

The best that can be done is to use top-quality equipment and follow the basic sound fundamentals. Design the speaker system keeping these steps in mind:

(1) Use the best speaker components available—low-distortion, linear, highest efficiency and good power-handling capability.

(2) Use a bi-amped, tri-amped or four-way system for lowest distortion and best use of amplifier power.

(3) Connect the amplifier directly to the speakers using short runs of large-gauge speaker wire.

(4) Choose a basic set of quality speaker components and enclosures and work with this one set until it sounds good. Make changes of speakers and enclosures until the basic set is as perfect as possible. This set should sound as good as a hi-fi speaker. If it does not sound good with a record played through it, then it can be improved. This basic set will have to be well-matched in dispersion, efficiency and phasing to pass the hi-fi listening test. Crossover points may have to be adjusted for optimum quality.

(5) Once the basic set of speakers is determined, add identical groups of the basic set and adequate power to increase the size of the total system for larger jobs that require a higher SPL.

(6) When many groups of the basic

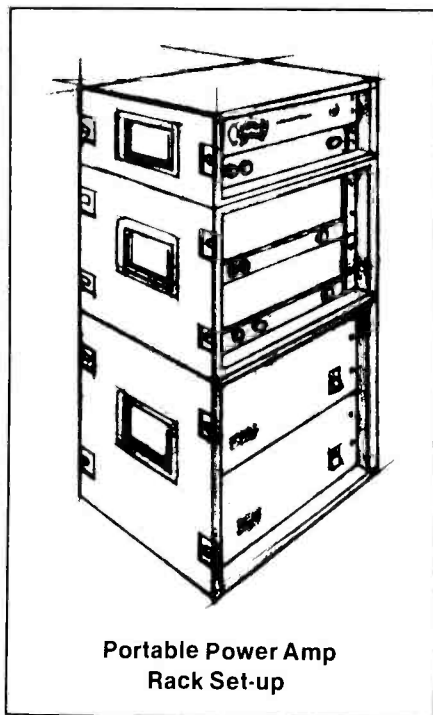
set of speakers are used together, they may have to be rearranged physically to achieve proper phasing and adequate angular coverage. Make sure all areas of the room are equally covered.

(7) When an extremely large room is encountered, use special long-throw horns to get the necessary direct sound out to the listeners. These long-throw horns will need to be on a separate graphic equalizer and power amplifier.

(8) If test equipment is available, equalize the whole system at every performance in order to minimize the acoustical effects of the room.

Stage Monitor Speaker System

The problems of design and speaker selection for stage monitors are the same as those for the main speaker system, so consequently the same basic rules described earlier can be used. The major difference to be noted is that the distance that the sound must be projected onstage is usually less than 20 feet, which requires lower power. The primary function of the



Portable Power Amp
Rack Set-up

stage monitoring system is to let the performer hear himself and the other performers so that the tempo and pitch of the music can be heard well enough to perform together. Also, the system must surround the stage with sound to give the performers the feeling they need in order to give an ener-

getic and exciting performance. If they do not like what they hear onstage, it will probably show out front and detract from the performance.

Because the primary function is to hear what is happening, a monitor system must be very loud but does not need to be full-range. A frequency range of 100 Hz to 10,000 Hz is adequate. Low frequencies in the monitor system only "muddy up" the sound on the stage, making the main system sound worse. These low frequencies do not help the performer to hear any better, and the high frequencies above 10 kHz are also of little help. Building a monitor speaker that goes down to really low frequencies necessitates a larger box, thereby increasing weight. Adding the super-high frequencies means more speakers or tweeters, and that will make the cost higher.

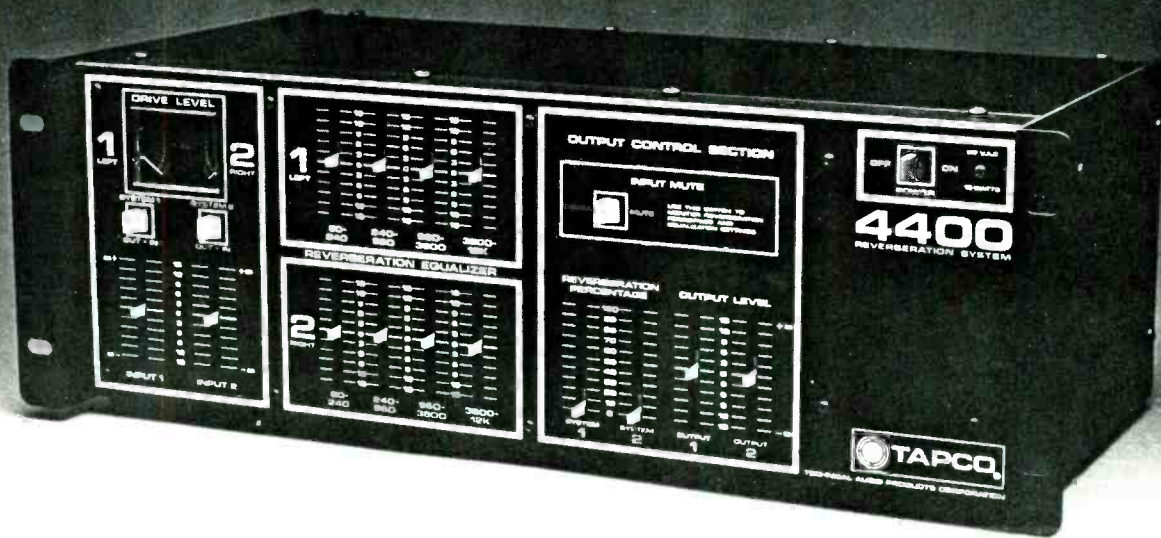
If the monitor system is to be loud, then it needs to be as free of feedback problems as possible. Feedback will usually occur where there is a peak in the monitor speaker system or the microphones. The room is usually not a factor here because the monitor speakers and microphones are in close proximity to each other. Since feedback occurs at a peak in the response of the monitors and mics, a monitor system that is more linear (fewer or lower peaks) will not feed back as easily, allowing the volume to be turned up louder. Usually, a monitor box using cone speakers only will produce a higher volume before feedback than a box using a horn. If the high-frequency sound of a horn driver is wanted, it should be used with an acoustical lens.

If the monitor system is two-way, a passive crossover is usually chosen for simplicity of operation. Most monitors will be small triangular boxes made to be set on the floor, although "side-fill" monitors are generally very large full-range systems placed to the sides in order to shower the stage with sound. A complex monitor system will be driven by several power amplifiers and will probably have its own graphic equalizer. Correct use of the equalizer will allow higher onstage volume and a better overall sound.

Mics and Technique

As always, there is not any one mic that solves all problems, and realistically there are easily several thousand microphone types being manufactured today. To get the whole story on microphones read *Microphones: De-*

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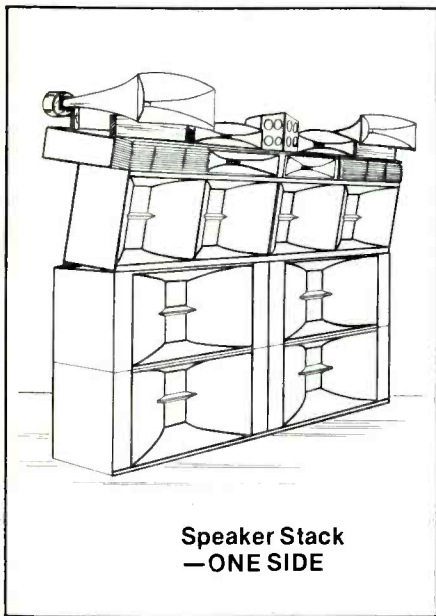
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CIRCLE 90 ON READER SERVICE CARD

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sign and Application by Lou Burroughs. This book will give complete information concerning microphone types, method of operation, coverage patterns and frequency responses.

However, there is some basic information that will help. There are three standard types of microphones in sound-system use: (1) dynamic, (2) condenser and (3) ribbon. The dynamic mic is used most often because it is very rugged. Condenser mics are fragile, but tend to give the best results when real acoustical sound sources are to be reproduced (vocals, horns, strings, woodwinds, drums, piano, etc.). In the past, ribbon mics have been too fragile for sound-system use, although there are several dependable ribbon mics today that are being used because of their smooth sound and high directional properties. Generally, condenser mics will be lower distortion, more linear, and have a wider frequency response than dynamic and ribbon mics; but if high-quality dynamic and ribbon mics are chosen, this difference will be extremely small and may be difficult to hear in a large P.A. system. The first rule of



Speaker Stack
—ONE SIDE

good miking is to "use your ears" and choose the mic that sounds best for the application.

Another point of concern when selecting mics is the coverage pattern. Once again, there are several standard types: (1) omni- or non-directional, (2) cardioid or uni-directional, (3) hyper-cardioid and super-cardioid (very directional) and (4) figure-8 or bi-directional.

The directional types are the most widely used because they reduce background noise and allow the sound system to be turned up louder before feedback. Some sound engineers are using noise-cancelling differential microphones, which greatly increase the sound-system loudness before feedback. Experience and care are necessary in the use of this type of mic.

In most concert sound systems today, highly directional dynamic and ribbon mics are used for vocals and horns. Directional dynamics are used for electric-instrument amps, bass drum, snare drum, tom-toms and percussion. Condenser mics are used as overhead mics, for acoustic pianos, strings, and sometimes horns, vocals and percussion.

In many cases, direct pick-ups from electric instruments and their amps are used. (An explanation of direct boxes follows.) On acoustical pianos, special electro-static pick-ups are used, and the results are far superior to using mics.

The most important rule in choosing a microphone is (1) "Try it! If it sounds good and does not cause problems, use it." (2) Always try to use good-quality, professional, low-impedance mics that are low-distortion, linear and have a wide frequency response. (3) Make sure all mics and mic cords are electrically phased the same so that there will not be cancellations in the final sound mix. (4) Use microphone shock mounts if mechanical vibrations from the floor (footsteps or dancing on wood floors) are transmitted up the mic stand and into the mic. (5) Use windscreens if the job is outside or if the vocalists are "popping" the mics.

Direct Boxes

A device originally utilized in a recording studio is the "direct box," and typically it is a small metal box with two standard quarter-inch "phone" jacks and a professional-type three-pin "Cannon" connector mounted on it. An electric instrument (guitar, bass, keyboard, etc.) is connected into one of the "phone" jacks and a microphone cord is plugged into the "Cannon" jack, allowing a direct signal to be fed into a low-impedance microphone input on a mixer. The second "phone" jack allows another cord to be connected between the box and the instrument's amplifier so that the musician can hear his instrument in the normal fashion.

The reason for its usage is that most instrument amplifiers are plagued by hum, hiss and poor frequency response. Consequently, miking the speaker and feeding the signal into the mixer will aggravate these problems. But with a direct box, the amplifier from the recording or P.A. equipment is bypassed.

Internally, the box contains a transformer to match the high-impedance instrument output to the low-impedance mixer mic input, while also giving isolation from hum-producing ground problems. A switch is often included to connect the ground (shield) wires of the instrument and the mixer line; the proper setting of this switch will minimize hum. Some more elaborate direct boxes contain a small transistorized amplifier to insure that the box will not degrade the frequency response and signal strength of certain guitars (most basses and keyboard instruments are not sensitive to "loading" by the transformer-type box).

Note that the signal feeding the P.A. system mixer is that of the instrument and any special-effect boxes (fuzz, wah-wah, etc.) that are being used by the musician. Any natural distortion produced by the amplifier will be bypassed. This can be good or bad depending on how "clean" a sound is desired. For typical P.A. applications, the direct box is most useful in connecting bass guitars and keyboard instruments to the mixer, since these instruments seem to have the most problems when used with typical instrument amplifiers and miked through a P.A. system.

A compromise solution for feeding the natural distortion of an amplifier to the P.A. system has been to connect a direct box to the speaker output of the amplifier. However, in many cases, the distortion doesn't sound the same as that produced by the speaker and, of course, any noise or other problems of the amplifier are fed directly into the sound system. Additionally, the direct box circuitry must be capable of handling the amplifier's output signal, which is much stronger than that of the instrument.

Wire and Connectors

It is immediately obvious that in a P.A. system of any size, the wiring will become quite involved. Consequently, here is a list of guidelines to follow for wiring:

(1) Standardize all microphone con-

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nectors on stage and at the mixer. The connectors used in professional systems are the three-pin "Cannon" types (Switchcraft A3M/A3F). Other brands are also available, insuring the ready availability of replacements in case of damage or system changes.

(2) Use high-quality, two-conductor cable with a braided shield for microphone cords. Two commonly used cables are Belden #8412 and #8413.

(3) In many situations, a lot of headaches and tangled cords can be eliminated by the use of a microphone "snake." This is basically a cable containing multiple pairs of individually shielded wires with a metal box containing microphone connectors at each end (or perhaps a "fan-out" of the individual cables at one end to allow connection of the snake to the mixer). The one cable is *much* easier to handle than many long microphone cords. The most widely used cable (commonly available in 6-, 9-, 12-, 15-, 19- and 27-pair configurations, which allows that number of microphone signals to be routed through the cable) uses a mylar-foil shield which is not as rugged as the braided shield found on standard microphone cables. For this reason, greater care must be taken in handling and storing the snake.

(4) Try to route the microphone lines, mixer outputs and AC power cables physically away from each other. If a snake is used to send the microphone signals from the stage to the mixer, this same cable should not be used to return the mixer's output to the stage amplifiers; also, if the system amplification is located at the mixer location, power should not be run down the snake to the speakers. Otherwise, it is possible for undesired leakage to occur between the higher-level mixer output lines and the microphone lines. This will cause what are called oscillations that can damage amplifiers and speakers, not to mention reducing the sound quality. Although many systems are successfully operated in this manner, a faulty shield in a cable can cause a sound system to suddenly develop oscillation problems.

(5) Use short, heavy-gauge cable to connect power amplifier outputs to loudspeakers. This is the reason why the amplifiers are located at the stage rather than at the mixer position. This rule must be followed if undue power loss in the speaker cable is to be avoided. In typical situations, 16-gauge wire is the absolutely

smallest size that should be used to connect woofers, and 18-gauge wire is the smallest recommended size for horns. Remember that more power is usually applied to the woofers, and the more power sent through a cable, the larger gauge it must be.

(6) Use heavy, high amperage-capacity connectors on speaker lines for the same reason as using heavy wire, as well as for durability on the road. A commonly used connector is the "twist-to-lock" two- or three-pin type used to connect electrical equipment. Be sure when using these connectors that they are not plugged into stage AC electrical power lines that sometimes use identical connectors.

Power Distribution

Since all electronic equipment used in a P.A. system requires a power source from the local electric company, some practical considerations should be examined.

An important factor is the maximum power consumption of the equipment from the AC line. A conservative approximation of this quantity can be calculated by tabulating all of the fuse sizes in all of the equipment. If the musicians' amplifiers are to be powered from the same AC circuit, these must be noted also. When all pieces of equipment have been noted as to fuse size, the sum of all the fuse sizes will give an idea of the circuit capacity required.

In many clubs, this much "juice" may not be available from one circuit. The net effect of this can be a blown fuse or circuit breaker in the club's AC distribution system during the hottest part of your show. If examination of the available amperage (as shown by circuit breaker or fuse size at the AC power entrance) shows a problem, then additional cords should be run to the stage from other circuits on separate fuses or breakers.

A problem can arise when using multiple circuits. Due to wiring in the building, hum, buzz or radio pick-up may result. If this occurs, the soundman must try plugging different equipment into different circuits. The mic mixer is often plagued by this type of problem, and it is usually necessary to run an extension cord to the mixer from the stage's AC power rather than plug the mixer into a nearby outlet.

Here are some additional rules:

(1) Carry many more AC cords and junction boxes than you will ever ex-

pect to use. You might be surprised sometime by an unusual AC wiring situation at a job!

(2) Use heavy-gauge wire with heavy jackets. Commonly used cables are types S, SO, SJ or SJT. These cables use a heavy rubber outer insulation that withstands much abuse.

(3) If long cords are used, they must be of a larger gauge to avoid power losses in the wiring. 16-gauge is rated to handle about 10 amperes, 14-gauge handles 15 amperes, 12-gauge handles 20 amperes, and 10-gauge handles 30 amperes. However, these ratings are for short runs, and while pulling full-rated current through a long run of cable won't harm the wire, you might find that your 120 volts from the plug has dropped 10, 20 or more volts at the other end. This impairs the efficiency of the power amplifiers.

(4) If a power cable becomes damaged, repair it immediately for safety's sake, not to mention continued reliability.

(5) At all costs, try to avoid running sound equipment from the same circuit as lighting equipment operated by electronic dimmers. The buzz generated by even the best dimmers can wreak havoc with sound systems.

A good, inexpensive book available at many hardware stores or electrical supply houses is *Wiring Simplified* by H. P. Richter (Park Publishing, Inc.). While aimed at residential-type permanent wiring, it includes many tables on wire size and a thorough text on good AC wiring practices.

For more complete information check the following reference books:

1. *Acoustics*, L. L. Beranek, McGraw-Hill Publishing.
2. *Acoustics*, Michael Rettinger, Chemical Publishing.
3. *Music, Physics, and Engineering*, H. F. Olson, Dover Publishing.
4. *Audio Cyclopedia*, H. M. Tremaine, Howard W. Sams Co.
5. *Sound System Engineering*, D. Davis, Howard W. Sams Co.
6. *Wiring Simplified*, H. P. Richter, Park Publishing.
7. *Microphones: Design and Application*, Lou Burroughs, Sagamore Publishing.

Now, check out the next two pages for a chronicle of everyday P.A. problems that can happen with any set-up.

A TRUE (?) P.A. STORY

After studying the *Modern Recording P.A. Primer*, consulting manufacturers' literature, and saving up some bucks, an energetic young recording engineer named Mike Plugg purchased enough equipment for a rental P.A. system. His company, Hornblower Sound, Ltd., consisted of himself and three co-workers from the local recording studio.

Mike and company were quite excited after the first contract was secured, and a good amount of thought went into organizing the job. The requirement for 15 microphone inputs on both the house mixer and the stage monitor mixer posed the only problem for the equipment they owned. Two 16-input consoles were rented from a professional equipment dealer along with a 16-input microphone "splitter" box that allowed a single mic to be fed into both consoles with a minimum of grounding and hum problems.

The system (see diagram) was loaded into a rented truck the night before the debut of the new system, and an early start was made to the concert hall. The show's promoter had promised that the auditorium would be open at 10:00 A.M., ensuring ample time for set-up before a 4:00 P.M. sound check with the band. However, Mike and his crew found themselves sitting on the stage door steps until past noon, much to their chagrin.

When the doors were finally unlocked, Mike learned that union rules required the stage crew to move the equipment in and set it up. Mike found himself running around to correct misplacement of the equipment by the well-intentioned but confused stage hands.

Then, Mike and Friends ran the various speaker and signal lines, forming a massive macramé of wire on the stage area.

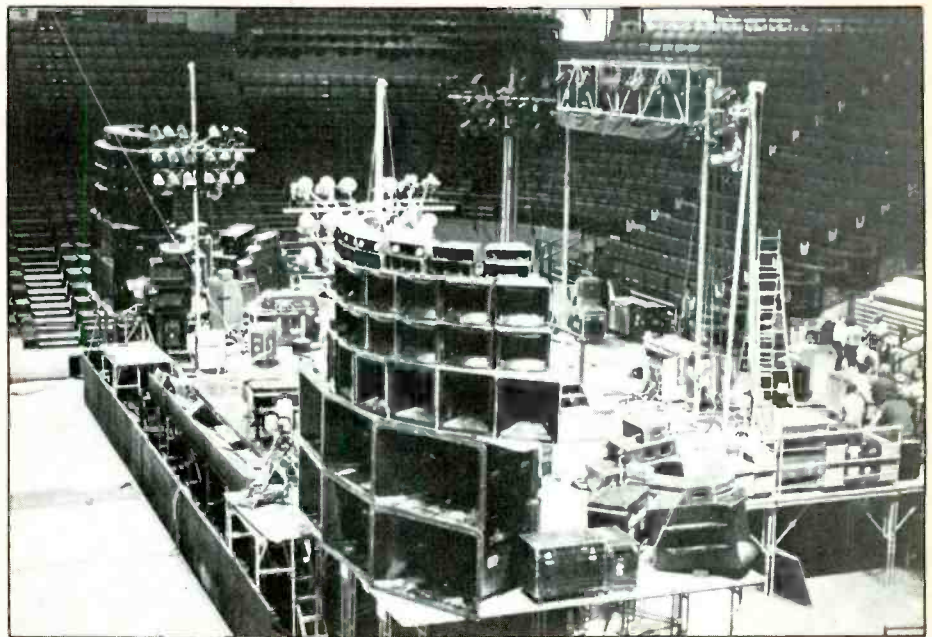
When the system was finally switched on at 3:00 P.M., something was wrong with the sound. In fact, the longer they tested the system, the worse it sounded. Soon, however, someone noticed that the 90- and 60-degree radial horns on the stage-left speaker stack had been connected to

the bass amplifier. A check of the horns after the connections had been corrected revealed that two were completely dead and the other two sounded quite raspy. (If all of the cable and connectors had been properly labeled, this expensive calamity wouldn't have happened. Another solution would have been to use dissimilar connectors for the different types of speakers and drivers. Finally, if Mike had wired a 100-volt 25- or 50-mfd capacitor in series with each driver, some might have been saved since the capacitor blocks bass to an extent and DC voltage from a malfunctioning amplifier completely.)

Having no spare diaphragms to replace the blown ones, Mike dispatched

outlet strips, such as made by Waber, Wiremold and others, so he wouldn't have to hog all of the power sockets.) The stage electrician saved the day and everybody had enough juice.

Next, Mike set about miking the instruments. A pair of Old Sony ECM-22 condenser microphones were placed overhead on the drums, and, since it was a simple drum kit, a pair of workhorse Shure SM-57's on the snare and bass drum completed that task; SM-57's were also used on the guitar amps. A direct box was installed between the instrument and its amplifier on the electric piano, synthesizer and bass guitar. The grand piano had been fitted with a Helpenstill pick-up by the music store from which it was rented,



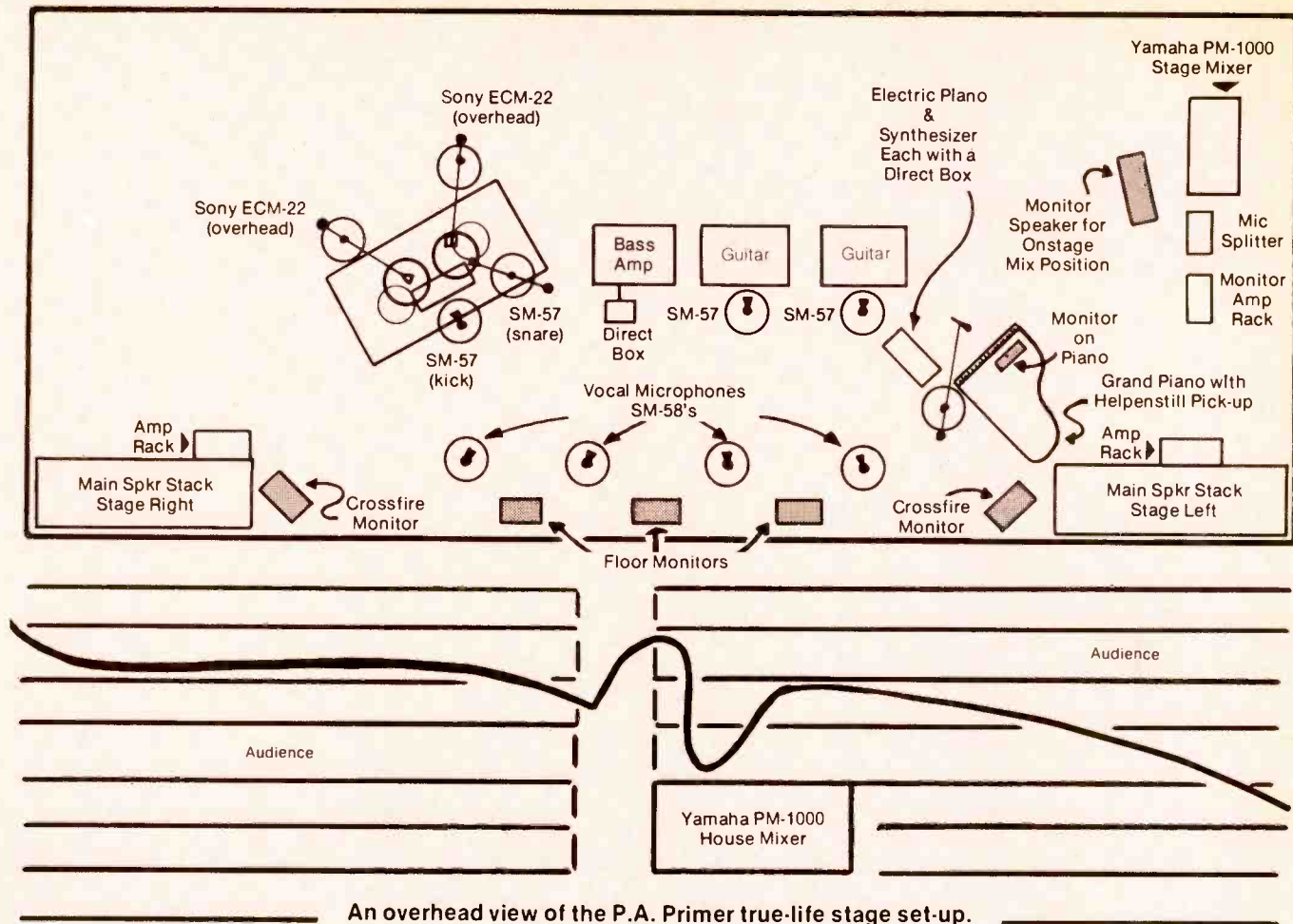
Example of a large system with horn-type enclosures throughout. (Photo courtesy Community Light & Sound, Philadelphia, Pa.)

a member of his crew to the friendly local audio dealer to secure some replacements. (He should have had spares for these easily abused items.)

Meanwhile, the band's road crew had arrived at 3:45 P.M. to unload the band's equipment. There were insufficient AC power outlets because Mike had tied up a number of stage "pockets" to operate his equipment. (He should have brought multiple

eliminating the need for microphones. Shure SM-58's were used for the five vocalists.

By now the blown diaphragms had been replaced, only to find that a buzz in the house system noted earlier had worsened. The problem was being caused by the house mixer which had been plugged into an outlet in the auditorium floor near the console, causing a ground problem. A series of



An overhead view of the P.A. Primer true-life stage set-up.

extension cords were run from the stage, and the buzz disappeared.

Against the objections of the grumpy piano tuner who had been demanding "Quiet" all afternoon, Mike adjusted the amplifier volume levels for proper balance between the numerous speaker elements. He used a tape he had mixed at the studio for a reference. (This is an acceptable procedure if the expensive test equipment necessary to do this "scientifically" is not available. Only familiar program material should be used, and the tape copy and playback machine should be in top shape.) Then, the monitor graphic equalizer was adjusted to attenuate feedback rings and "sweeten" the sound.

The sound check progressed well except for dealing with a couple of "Stars" in the band. Finally at 5:45, the Hornblower sound crew was able to grab a burger at a nearby beanery.

When the house lights were finally dimmed for the beginning of the concert at 8:15, Mike realized that it was too dark to see the controls on the

house mixer. He tried vainly to get help from his stage crew by wildly flailing his arms. (A good headphone communication system between the stage and mixer is invaluable at moments like this.) A nearby usher thinking Mike was having an attack hurried over. Mike immediately noticed the man's flashlight, and the usher was grudgingly convinced to loan his light to the hapless Mike. (A small high-intensity desk lamp would have worked well if Mike had brought one.)

Halfway through the show, a blown fuse in an amplifier disabled a portion of the system. (Guess what Hornblower Sound, Ltd. forgot to pack?) Then, someone in the audience tripped over the console's extension cords and unplugged it. (All cords in the audience area must be taped down. That is why grey "duct tape" is rightfully called the soundman's best friend.)

Completely dazed, Mike was overjoyed when the show concluded. Packing up was a real hassle due to the tangle of cords on the stage. (A few extra minutes spent in set-up to neatly

route the cables saves hours after the show.)

The exhausted crew departed at 2:00 A.M. looking forward to the "calm" sanctuary of the studio. However, Hornblower Sound, Ltd. ironed out their problems and gained respect for their quality sound within the "biz" in a short time.

Epilogue

Authors have a tendency to continue on and on with their writing, especially if they enjoy the subject they are writing about. This P.A. Primer series has been no exception. In an attempt to be thorough, this article mushroomed from one to three parts! However, now that the major points of interest have been discussed, this article is drawing to a close. Since a set of encyclopedias could be written on P.A. system equipment usage, many subtle things have not been mentioned. It is felt, though, that a good background has been presented in this area. We hope you agree.

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CIRCLE 36 ON READER SERVICE CARD

By Gil Podolinsky

DSR Productions was founded in mid-1972 by two former members of Creedence Clearwater Revival, Doug Clifford and Stu Cook, as well as their engineer, Russ Gary. DSR operates a production company based at Cosmos Factory in Berkeley, Cal. The mainstay of their work involves the use of their mobile recording unit, whether it be used in conjunction with Cosmos or hired strictly as a mobile. The

DSR mobile has been involved with such recordings as Concord Jazz Festival (last three years), Perry Como, Earthquake, Country Joe, Billy Joel and an extensive six-city "live" recording of Jesse Colin Young. This interview with John Flores, engineer, and Bruce Young, administrator functionaire, both of DSR, took place in Seattle, the first leg of Jesse's tour.

Modern Recording: John, how did you become involved in engineering and DSR?

John Flores: I took a vacation after college and was offered a job with Creedence, which is basically DSR, as their lighting engineer. When that ended, DSR came into existence and I began to learn about engineering through Russ Gary, who was Creedence's engineer. All of my knowledge over the past three years has come in that way: on-the-job-training. I have only done multi-track recording, which is probably a big limitation. Most of what I've learned has come through close-miking situations. For example, I've never done a symphony, where I'd be concerned with only miking the acoustics of the hall.

MR: It seems that more and more, artists are using mobiles to record, not only for "live" albums, but for studio albums as well.

Bruce Young: That's true. It's all a question of an artist feeling at home. For example, an act that is signed to DSR practices at and is recorded at the Factory, by the mobile, which can be assembled or disassembled in five minutes. Mobiles have really become the trend. The various members of Crosby, Stills, Nash and Young won't go anywhere without one.

MR: Is it financially limiting in any way, either to yourself or the artist?

BY: Well, our fee in the Bay Area is \$1500 a night, which includes everything but the tape. We don't normally leave the Bay Area. We did with Jesse

because we recorded him at the Boarding House and did it as a favor. When you rent the mobile, you get everything, I mean we don't watch the clock, or fail to put ourselves at the renter's disposal. You rent the entire services of DSR. We are basically a production company. We don't do jingles, or an outside label/artist can't hire the Factory. You can rent the mobile and use your own engineers, as was the case with Concord and Billy Joel. Remote recording is basically a weekend thing, since there are few artists who can pack a hall on a Tuesday night. Plus, this is the time when our own acts are out working so we can afford to rent it out.

MR: How did this remote recording with Jesse come about?

JF: Well, we did Jesse's recording at the Boarding House and he liked the results, so here we are.

MR: Can you give me some impressions of what it's like working with Jesse?

JF: Well, Jesse knows sound and knows what he wants. One of the jobs of an engineer is to please certain people, and in this case, it's to please the artist/producer. Jesse is quite apt at changing hats in that regard. But, there are a few areas that solely imply independence of thought on Jesse's part that are different from the norm.

MR: Such as?

JF: Well, the use of baffles is a good example. Normally, baffles are not used on a "live" recording for reasons of getting that meshing of the in-

struments, which constitutes a "live" sound.

MR: Since Jesse won't allow the photographing of his stage set-up, and I can understand an artist's desire to protect his sound, could you describe the basic mic and baffle set-up?

JF: O.K. First off, all the mics used are Jesse's and the various mics used on the instruments are of Jesse's sound conception. Jesse's vocal mic is an AKG 414. It has fine quality characteristics and good rejection. For his voice, it's very unique—he swears by it. On the drums, he has an Electro-Voice 666 on the kick, a Neumann U-87 in a figure-eight pattern on the shell toms and one on the floor tom picking up the cymbals; on the hi-hat we use a Shure 56; the snare has a Sennheiser, either a 412 or a 421, which is miked off to one side—which, as I said earlier, is all Jesse's placement. Actually, in recording Jesse, all the engineer has to do is put down levels. Jesse uses condenser mics on the guitars, which I find unusual, but he likes the high fidelity. Usually dynamic mics are used over condensers in remote recording because they can take the physical punishment of being moved around. On the keyboards we use a Helpinstill pick-up on the grand piano, which he brings with him. With a little heavy EQ, it sounds like a real piano, rather than an electric reproducing a piano; on the Fender Rhodes, it's either a Beyer or an AKG D 1000 E on a direct line. The bass is a Shure 56 miked direct. The horn is an RE-20, and on

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Manufacturer	Brand	MAGAZINE A		MAGAZINE B	
		S/N Ratio Weighted in dB	Output @ 3% THD	S/N in dB (re: 3% THD)	THD at 0 dB (%)
TDK	SA	66.5	+4.2	66.0	0.9
AMPEX	20:20+	56.4	+1.9	—	—
FUJI	FX	60.0	+2.3	—	—
MAXELL	UD	—	—	58.5	1.1
MAXELL	UDXL	62.5	+2.7	—	—
NAKAMICHI	EX	60.0	+2.3	55.0	1.1
SCOTCH	CHROME	—	—	64.0	1.3
SCOTCH	CLASSIC	62.5	+2.0	—	—
SONY	FERRICHROME	64.0	+2.1	64.0	1.8

Decks used for tests: Magazine A-Pioneer CT-F9191 (cross-checked on DUAL 901, TEAC 450); Magazine B-NAKAMICHI 1000.

Two leading hi-fi magazines working independently tested a wide variety of cassettes. In both tests, TDK SA clearly outperformed the other premium priced cassettes.

The statistics speak for themselves. TDK SA provides a greater S/N ratio (66.5 dB weighted and 66.0 dB @ 3% THD), greater output sensitivity (+4.2 dB @ 3% THD), and less distortion (THD 0.9%) than these tapes.

When you convert these statistics into sound, TDK SA allows you to play back more of the original signal with less distortion and noise.

Put these facts and figures together and TDK SA adds up to the State of the Art because it provides greater dynamic range. This means cleaner, clearer, crisper recordings, plain and simple. Sound for sound, there isn't a cassette that can match its vital statistics.

Statistics may be the gospel of the audiophile, but the ultimate judge is your own ear. Record a piece of music with the tape you're using now. Then record that same music at the same levels using TDK SA. You'll hear why TDK SA defies anyone to match its sound.

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the higher horn, a Shure 56. The baffling is done primarily to avoid leakage, like the cymbals have a tendency to get into everything, and the RE-20 has a habit of picking up everything. The isolation of the horn mic is very important for "live" recording. The organ mic is built-in, so it already is baffled. The Leslie is miked from the inside, a Sony ECM-50, in the middle.

MR: How does this set-up differ from that of his studio recordings?

JF: I haven't recorded for Jesse in the studio, but apparently this is the same exact set-up with the difference of the addition of an audience mic. It's the same mics, same track assignment.

MR: What is the basic track assignment?

JF: Well, Jesse basically has everything in stereo, two inputs on all. We are equipped with 24-in, 16-out.

MR: Do you have any preference on your track assignments?

JF: It depends. With Jesse, my normal preference would be to put bass drum on tracks 1 and 8, for example, but he doesn't like it. He prefers giving four tracks to the drums—kick, snare and shell toms with the floor tom and hi-hat on a separate track. Given my choice, I'd put 1 and 8 on 16 and save the outside track for overdubbing percussion. That brings up an important point which is so often overlooked—studio overdubbing on "live" recordings. It's done more often than not. Jesse's vocal is miked individually, and like everything else, is close-miked. Finally, the two audience mics combine to one.

MR: How do you prepare for a remote recording?

JF: Well, we try to arrive at the hall days before the recording to set levels, get a feel, etc. For example, this

theater (Paramount Northwest, Seattle) has fine echo and if used properly will enhance the sound.

MR: Are you recording off of the P.A., or the monitor?

JF: No, both our mics and Jesse's mics go direct through the splinter boxes where half of it goes to the truck and the other half to the P.A., which the sound crew (in this case Silverfische of New York) splits the feed in half again for the outside P.A. and monitor. I'll try to distinguish Jesse's sound for you in words. He likes to get the flow between himself and the music. The comparison is that where some people like to have acoustic guitar jangling away in each ear and will use various strumming effects to get it to play back and forth, Jesse will achieve the same thing by taking one instrument and phasing it differently from the next. It's all in the placement of each phasing.

MR: Would you describe the DSR mobile unit itself?

JF: Sure. It's a GMC truck. We bought the cab and rails and Frank deMideo then designed the board and the body, which was built to his specifications at Universal Truck Body in L.A. The equipment consists primarily of two 3M 16-track recorders. The custom deMideo board incorporates APL amps, EQ's and faders. It's 24-in, 16-out; a complete patch bay; four UREI limiters and two additional Pultec midrange EQ's. Monitoring, with quad, stereo and mono capabilities, is powered by McIntosh 2100 power amps. The speakers are Altec 604 E monitors in custom cabinets, acoustically tuned and utilizing a unique sound ramp for flat frequency response. We also use a wide selection of mics.

MR: Apparently you've devised a

remote with several additional features that no other mobile offers.

JF: True. The patch bay is more extensive; we have a stage-truck, audio-video communications link-up. We also have more outboard gear than most; there are dB pads under the board; obviously the quad monitoring is an extra. Further, we have four separate cue mixes with separate echo-send for each. Also, we don't have the problem of our echo being a spring-loaded chamber.

The design is different as well. Our 604's are located over the cab. But where most mobiles have the board eight feet or less away from them, ours is twelve feet in order to get a good sound throw. Twelve feet isn't perfect, but obviously better. The further back, the less the separations from left to right due to the width limitations of the truck. We have a tunnel effect. The ramp goes down from the 604's to the console such that the engineer is in an excellent position—the center.

MR: How was the truck sound-proofed?

JF: It is isolated by fiberglass to eliminate high-frequency bounce and the other problem of bass feedback bouncing off the bare side walls. When we're at the Factory, we simply open the back door and let it escape that way. But, to continue, the truck was sprayed with styrofoam, one and three-quarters of an inch on each side, and three inches on the top and bottom.

MR: Roughly, what is the cost of the mobile?

JF: I couldn't say exactly. The truck cost \$10,000; the board \$50,000; two 16-tracks at \$20,000 each, so . . .

MR: So we're talking six-digit figures.

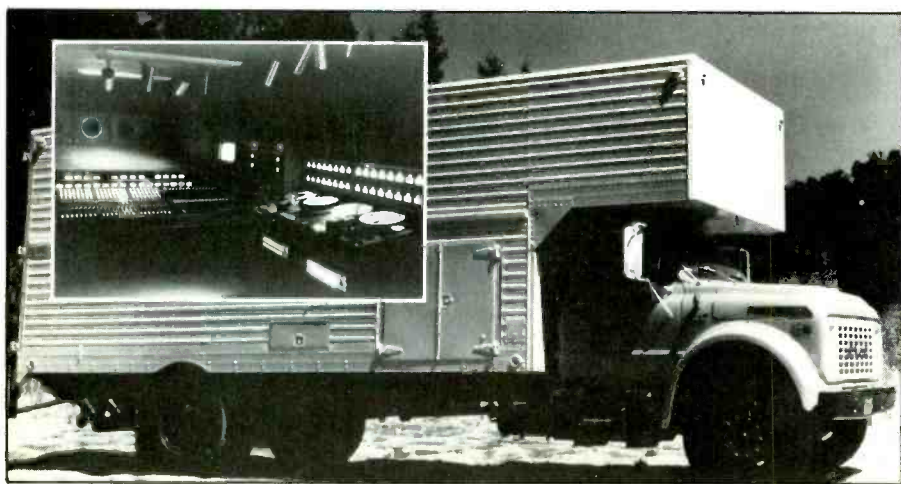
JF: Easy.

MR: What do you use for power?

JF: We take our power from the hall. We use 220, one leg of it for lights, etc., and the other for the board, tape machines, which we isolate as much as possible. We have our own circuit breakers and power supply for the board. We don't have our own generator. With everything on, we draw almost 25 amps.

MR: How close do you need to be to the hall?

JF: We can be 500 feet for audio, 700 feet for power. Always, the closer the better but you don't want to get close enough to get stage echo.

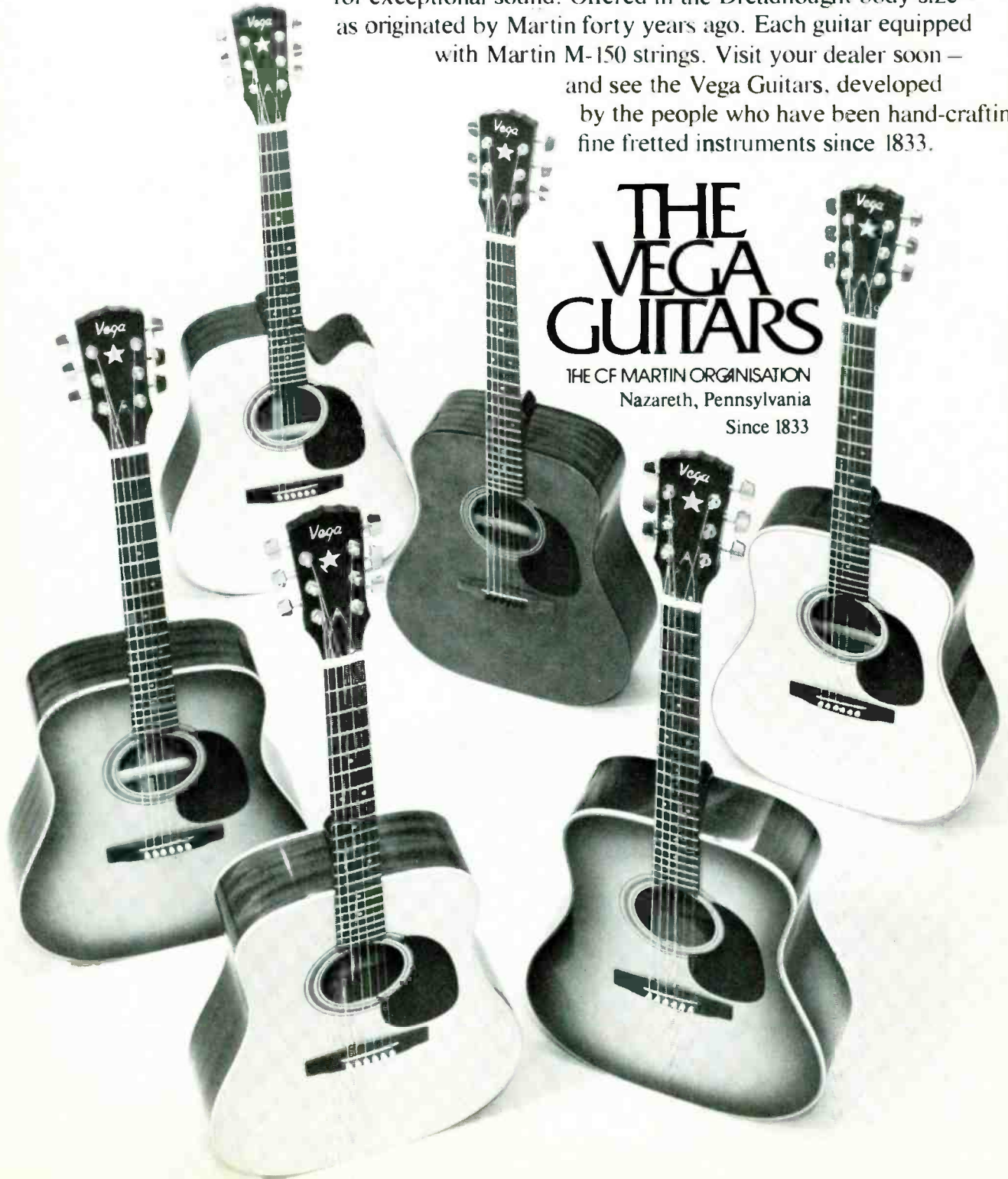


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CIRCLE 96 ON READER SERVICE CARD

Ambient Sound

BY LEN FELDMAN

Ambient Sound

No, that's not a typographer's error. This month, the name of the column and its subject are the same. In a previous issue (June/July 1976) I stated that I thought the "last frontier" of audio was the quest for improved dynamic range and reduced residual noise. At that point, I was presuming that quadrasonic sound was gaining in popularity and that it would prove to be the route toward faithful recreation of the ambience or acoustics of the concert hall.

To date, that has not proven to be the case. Four-channel sound has *not* gained the acceptance which pundits were predicting for it just a year or two ago. Nor are most of the samplings of four-channel recordings (be they matrix or discrete) engineered to recreate hall ambience. Rather, somewhat enamored of the spatial potential of quad, recording engineers have let themselves go and have created discs which place the listener in the center of the action, with primary musical information coming at them from all around. The hi-fi buffs have not exactly rushed to accept this approach to musical reproduction. I am not suggesting that sound in the round is the only thing that has turned people off to quadrasonic sound. Conflicting systems, problems of speaker placement, double inventorying of records [Columbia Records may sway the competition to single inventory, a policy which it adopted in May after observing EMI/Angel's trend-setting move—Ed.], cost of equipment, and related attempts to deliver quad gear at prices that will not scare away consumers have all contributed to the stunted growth of quadrasonic sound in this country and abroad. But certainly, the unfulfilled promise of the recreation of hall acoustics (which, properly engineered at the source, is, in my opinion, still possible) has soured many serious music lovers with respect to four-channel sound.

A New Alternative

It has long been felt that hall ambience could be recreated in a home listening system by means of

audio time-delayed signals derived from the primary stereo information contained in most recordings. Acoustical engineers have made extensive studies of just what happens to sounds generated from onstage in the great concert halls of the world. Terms such as first-reflection, decay and reverb time are familiar to all acousticians, and many years ago the first feeble attempts to recreate these effects in a home environment evolved into so-called "spring" or mechanical reverb units which enjoyed some acceptance well before four-channel sound came upon the scene. Unfortunately, the mechanical spring reverb units suffered from a characteristic "twangy" sound, uncontrolled resonances, and an inability to control delay time or frequency response of the reverberant channels.

In professional applications, attempts at creating ambience channels were, at first, accomplished by using magnetic tape loops. By proper spacing between record and playback heads, delay time could be varied and, to some degree, controlled as far as frequency response and decay was concerned. Such tape delay systems are still in use in some recording studios around the country, but they suffer from the usual wow-and-flutter problems (especially audible in delay systems of this kind), tape wear of the loop and head wear.

With the development of large-scale integrated circuits, it became possible to design and manufacture wholly electronic time-delay units, and the first of these, costing several thousands of dollars, soon found their way into the more affluent studios around the country. Only recently, however, have IC costs come down to a point where it is possible to offer all-electronic time-delay units for consumer use with stereo high-fidelity systems.

Two such units have made their appearance in recent months. The first is a digital time-delay unit developed by Audio Pulse, Inc., a division of Hybrid Systems, Inc. Their unit employs analog-to-digital conversion of the incoming audio signals. Once the program has been converted to digital form, it can be time-delayed by amounts ranging from 8 to 94 milliseconds and decoded back to analog form. Reverberation decay time

(the time required for "late reflections" to decrease in amplitude by 60 dB) is also controllable. Outputs of the system, which are intended to be reproduced over two additional loudspeakers (which need not be of the same high quality as the "primary" stereo pair nor driven by as powerful a pair of amplifier channels) are "rolled off" in frequency response above around 8 kHz to duplicate the roll-off of reflected hall sounds that takes place in "real" life. Cross-mixing of the reverberant information takes place in a complex but predetermined way so that the multi-directional and incoherent character of these sounds is established much as it would be in a concert hall.

The second of the products now available for consumer use is a development of Sound Concepts, Inc., their Model SD-50. This audio delay unit uses direct analog signals which are passed through a series of capacitive elements at a rate determined by a clock signal. The technique is known as "bucket brigade" time delay. Initial delay of this system is variable from 5 to 100 milliseconds and high frequency roll-off is proportional to time delay selected. Reverberation is also variable and offers decay times of up to 2 seconds. Unlike the Audio-Pulse unit, the Sound Concepts model maintains balanced delay and phase for the two rear, delayed channels.

Both units are extremely effective in what they do, and the purpose of mentioning them here is not to evaluate which is the winner in this first-generation of consumer time-delay products. It is, rather, to point out that these *are* first generation products. Now that the ice has been broken, the possibilities of electronic time delay and more perfect duplication of the listening environment which we call "ambience" is sure to be explored in greater depth. That study is well under way in at least one laboratory—at Acoustic Research (AR), as I mentioned in my last column.

Advantages and Dangers

There are several things about electronic time delay which bode well for its future in the audio scene, but there are also a few danger signs which, if ignored, could abort the orderly growth of this next important hi-fi development. On the positive side, we are not going to be confronted with problems of software or incompatibility of competing systems. Time delay and reverberation can be achieved in several ways, but the end goal of each is the same. Properly used, time delay works well with existing program sources. Just about any stereo record I have played using both available time-delay units has benefited from this type of sonic expansion. In fact (and this is something that neither matrix nor discrete four-channel systems could claim), even monophonic program materials, such as pre-stereo LP's, mono FM programs and even AM radio programs, took on a concert-hall quality when subjected to time delay. Another plus comes from the fact

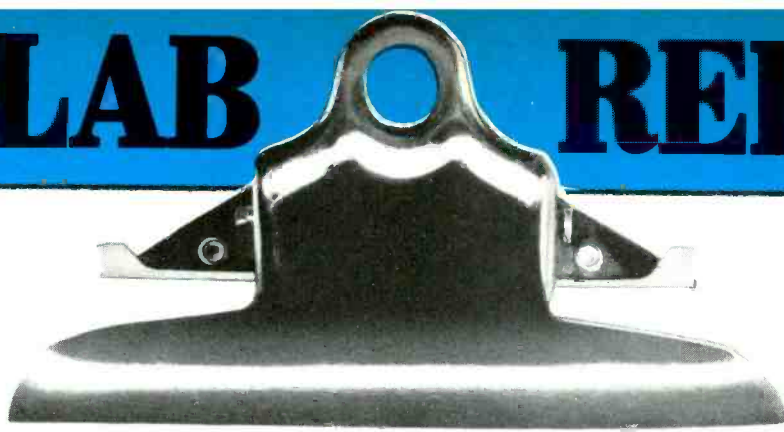
that the amplifiers required for the secondary channels and the speakers used to reproduce the delayed reverberant sound need not be of as high a quality or power output capability as the primary stereo channels. It is a well-known fact that as sound undergoes multiple reflections from walls, floor, ceiling and other surfaces in a large concert hall, high frequencies are progressively attenuated with each successive reflection. For this reason, both the Audio Pulse and the Sound Concepts units have response characteristics (for the secondary channels) which roll off highs at anywhere from around 4 kHz to 8 kHz. Obviously, super-tweeters are not called for to reproduce such ambience. And since the energy content of the ambient sound heard from a "good" seat in a concert hall is likely to be a fraction of that of the primary signals reaching us from on stage, lower-powered amplifiers to drive the secondary speakers will suffice. From an economic point of view, therefore, switching to "time-delayed sound systems"—once the investment in the basic signal processor has been made—will not mean a "doubling of everything" as was suggested in the case of four-channel systems.

As for the dangers to be avoided, the basic criteria applicable to any piece of sound-reproducing equipment still apply. If, in an attempt to turn audio time delay into a mass-market (inexpensive) "gadget," manufacturers begin to sacrifice signal-to-noise ratios, we will at once lose dynamic range (another vital ingredient in realistic sound reproduction) at the expense of "hall sound." System signal-to-noise is, after all, determined by the S/N of the noisiest component in the reproducing chain. The same is true of distortion, which must be kept low for the reverberant channels, as well as in the primary stereo channels.

Recording engineers can help to improve the effects to be gained with time-delay augmentation, too. I feel sure that if recording studios begin to monitor their "takes" in the control room using time-delay devices of the type described, mixdowns could be more carefully tailored to take advantage of ambience possibilities for those users and listeners who may want to equip their systems with devices of this kind.

A few years ago, time-delay units such as those already developed by Audio Pulse and Sound Concepts would have occupied more space than all the rest of a high-fidelity component system. Today, each of these devices is no larger than a small preamplifier or amplifier. Perhaps the time is not too far away when even the seemingly complex experimental 16-channel time-delay system developed by AR may be able to be reduced in size and cost so that it will become a desirable add-on product for professionals and home listeners. Based upon my earlier, premature statement regarding "last frontiers" in audio, it might be safer to say that audio time delay is the *next*—but by no means the *last*—area of audio research that will occupy our collective attention in the immediate future.





NORMAN EISENBERG AND LEN FELDMAN

Nakamichi 600 Stereo Cassette Tape Recorder



General Description: The Nakamichi 600 is a stereo cassette tape recorder of unusual design and extremely high performance. It handles the standard Philips cassette and employs two tape heads, one for erase and the other a combined record/play head. The latter is described as a focused-field crystal permalloy type that makes for enhanced response, dynamic range, and other desirable characteristics. The head is said to engage the tape's entire thickness at a proper recording angle (nearly 90 degrees), while also minimizing the area of "critical zone" across the gap.

The enhanced dynamic range of the unit is reflected in its unusually wide-range VU meters (one per channel) which cover values from -40 to $+7$ dB. These are peak-reading meters.

Bias and equalization are independently switchable. In addition, the bias itself may be adjusted via a front-panel calibration control. This arrangement permits unusual (for a cassette deck) flexibility in adjusting the machine for a very wide variety of tapes.

The unit has a built-in Dolby noise-reduction circuit with a 400-Hz test tone option and adjustable record-level calibration controls. It also has a built-in MPX filter for assuring no interference from the broadcast 19-kHz stereo carrier when recording FM off the air.

A really unique feature in this unit is its IM suppressor circuitry, designed to reduce non-linearities due to tape saturation. To keep both the Dolby system and the IM suppressor from erring in the processing of a signal, the model 600 also incorporates phase-correction circuitry, intended essentially to prevent the nor-

mal harmonics of a musical tone from shifting in phase relative to the fundamental frequency.

The transport is typically Nakamichi—precision-built, stable and reliable. It is driven by a DC servo motor and maintains speed regardless of fluctuations in either line voltage or line frequency.

Physically, the model 600 looks unlike any other cassette deck, although its overall shape is reminiscent of the Yamaha 800. That is to say, it employs a slanted operating panel on which are installed all the main facilities. At the upper left are the tape counter and reset button, and a tape-memory button. Below them is the cassette well with its hinged lid. Below this area are the transport keys with the usual functions including a pause control.

The two illuminated VU meters dominate the upper right portion. Below them are several switches for tape selector, EQ, the 400-Hz test tone, power, the IM suppressor, the Dolby circuit, and the MPX filter. Additional controls below this row include those for bias calibration, record-level calibration, and IM suppressor calibration. Finally, there are the knobs for output level, input level on each channel, and master input level. The panel is finished in brushed aluminum of fairly heavy gauge and is fitted with handles.

The rear panel contains phono jacks for stereo pairs of input and output, as well as a DIN socket and the AC line cord. The model 600 may be operated from AC power sources of 100-117, or 220-240 volts (50/60 Hz). It is rated to consume a maximum of 15 watts from the power line.

The model 600 has no microphone inputs, no built-in mixing facility, and no headphone output. These facilities are available on Nakamichi's model 610 preamplifier which also includes a host of other features for general system applications. MR has not yet had an opportunity to evaluate this preamp, but preliminary examination indicates that it may well be the most versatile preamp yet offered. Combined with the 600 deck it makes up a "mini-studio" which, for size and cost, would seem to be unprecedented. Without the preamp, however, the model 600 still will record from "line level" sources and, of course, play recorded tapes for feeding into external amplifiers at input levels of up to 0.6 volt.

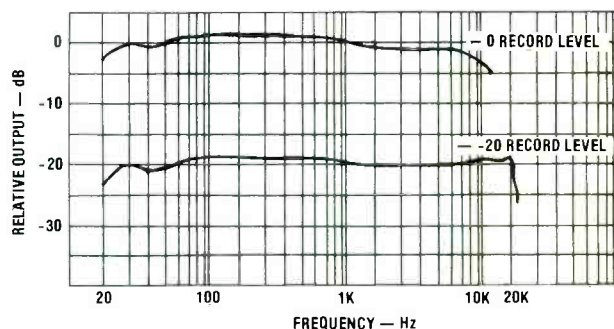
Test Results: To make the point quickly, MR has found the Nakamichi 600 to have the best performance capability of any two-headed cassette deck its staff has yet encountered. This verdict applies to everything about the unit, from the very functional and attractive front panel to the novel circuit features behind it. Using Nakamichi's own EX-II and SX tapes, the model 600 proved to have response in excess of 21 kHz (which we had seen previously only on Nakamichi's own costlier three-headed decks, the models 1000 and 700). Published specs were either confirmed or exceeded in MR's tests, and the whole picture simply can be summed up as excellent. The headroom signal built into the model 600 is especially noteworthy, and the IM suppressor circuit actually can compensate and correct for the nonlinear characteristics of tape as recording level reaches the saturation point. Properly used, this feature can enable recording up to a level of +8 dB, but even before using this special circuit the recordist is "ahead" of the game in this respect. MR notes that the IM suppressor should be adjusted for each different formulation of tape used, and that the readjustment requires the use of a signal generator and distortion analyzer. As supplied, the model 600 is preadjusted to match Nakamichi's own EX-II and SX tapes, and the owner's manual states that the IM suppressor modifications are not user-adjustable.

In checking response using both Nakamichi tapes, MR found that the results were virtually identical. At the -20 dB recording level, response was within a few dB from 20 Hz to beyond 20 kHz. Other characteristics were consistently excellent, including signal-to-noise, wow and flutter, and distortion. Transport action was smooth and responsive; meter readings, accurate.

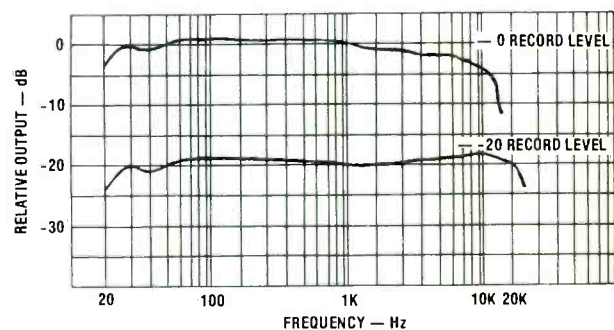
General Info: Dimensions are: 15 $\frac{1}{4}$ inches wide; 9 $\frac{1}{8}$ inches deep; 6 $\frac{7}{16}$ inches high (in millimeters: 400 x 237 x 170). Weight: 14.3 lbs. (6.5 kgs.). Owner's manual is excellent. Price: \$500; in optional black-matte finish, \$520.

Individual Comment by L.F.: Our test results just about speak for themselves. The 600 is the best two-headed cassette deck I have ever examined, and the sloped panel affords visibility and control access that beats either the front-loading or the more conventional table-top design. I am sorry, however, that we could not evaluate the 600 together with its companion preamp, the model 610, since together the pair would prove very useful for "live" recording as well as for a number of other audio functions not normally included in this type of equipment. But even without those options, the model 600 on its own is a very attractive machine for recordists who plan to dub from cassette masters, or from high-signal level sources in general, and for most home hi-fi functions. Not to be overlooked either is the unit's size and weight which make it fairly easy to tote around for on-location recording work. It seems to me that a very good "\$500 worth" is being offered here.

Individual Comment by N.E.: The Nakamichi 600 is—stylistically and somewhat functionally—part of a new series of products which include the 610 preamp, an optional remote-control unit (model



Nakamichi 600: Record/play response (using Nakamichi EX II tape).



Nakamichi 600: Record/play response (using Nakamichi SX tape).

RM-610), and a stereo power amp (the model 620 rated for 100 watts per channel), all of which were introduced recently as Nakamichi's "Recording Director" series. A special rack-mount is available for installing these units and it is my guess that this option will appeal to many pro and semi-pro users plus a significant share of the home hi-fi crowd since the set-up can easily become the heart of a first-class sound system with options and versatility yet to be offered elsewhere. I don't want to "scoop" ourselves but the preamp for instance can combine any five of 19 different inputs, and it also has built-in facilities for making spot-checks of various audio components. As for the model 600 "as is," you can buy more features for the same price, but not—according to our test results—the level of audio performance of the model 600.

NAKAMICHI 600 STEREO CASSETTE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Frequency response (EX tape)	20 Hz to 21 kHz \pm 3 dB
Frequency response (SX tape)	30 Hz to 21 kHz \pm 3 dB
Harmonic distortion at 0 VU	
w/o IM suppressor	1.3 %
with IM suppressor	0.3%
Harmonic distortion at +3 VU	
w/o IM suppressor	1.5%
with IM suppressor	1.0%
Recording level for max 3% THD	
w/o IM suppressor	+ 5.5 dB
with IM suppressor	+ 8.0 dB
Signal-to-noise, unweighted	
w/o Dolby	50 dB
with Dolby	63 dB
Wow and flutter	0.05% (WRMS)
Line input sensitivity	60 mV
Output level	600 mV
Fast wind time (C-60)	110 seconds
Bias frequency	105 kHz

CIRCLE 9 ON READER SERVICE CARD

Sony TC-880-2 Open-Reel Tape Recorder



General Description: The Sony TC-880-2 is an open-reel recorder that operates at 15 ips and at 7½ ips speeds, and can handle reels up to the NAB 10½-inch diameter. Basically a half-track model with separate heads for erase, record and play, it also has a fourth head for quarter-track play. The unit has a sophisticated transport and offers some unusual and worthwhile features in this section and in its electronics.

The transport uses two capstan drives, powered by a servo-controlled, direct-drive motor. In addition, there are two induction motors for the reels. Heads are ferrite. The VU meters are peak-reading, but they have a three-position switch that allows them to function as ordinary VU meters, fast-acting peak indicators, and "peak hold" indicators whereby the meters will show only the highest peak for a given program. Each meter itself is generously proportioned, with calibrations from -40 to +15. Instead of the traditional swinging needle, these meters use a thin beam of light to show scale readings.

The tape-index counter is unusual too in that it shows actual time elapsed in minutes and seconds. For 15 ips speed, the time shown is true time; for 7½ ips speed, the time shown is half true time. For synchronous add-on recording, the Sony TC-880-2 has provision for using either half of the record head to play, while recording simultaneously on the other half-track. In this machine, Sony calls the feature Syncro-Trak. Bias is switchable (two positions), as is recording EQ (three positions).

Another novel feature is a fine-speed adjustment optional at either speed. Transport controls are "logic system" types and permit fast-buttoning, reel-rocking, and punch-in recording. A special feature of the unit's playback electronics is phase-compensation circuitry which is designed to reduce distortion caused by phase variations, and especially to reproduce with greater accuracy previously recorded four-channel matrix material from a two-channel encoded format.

In addition to the front-panel mic jacks, there is a stereo pair of balanced (Canon-type) mic connectors at the rear. Here too are the line inputs and outputs (pin-jacks); a socket for an optional remote-control device sold as an accessory; the AC power socket and a convenience AC outlet (unswitched); a grounding post; and a two-amp fuse holder.

The Sony 880-2 is designed for vertical installation. The owner's manual is quite thorough, amply illustrated, and contains a list of nine recommended tapes for different bias and EQ switch positions.

Test Results: In MR's tests, the TC-880-2 did best using Sony's own tapes, either its low-noise high-output SLH, or its ferrichrome (Fe-Cr). With standard tape (Sony's PRO-150) the machine fell short of meeting response specs at the slower speed, being within ± 2 dB out to 16 kHz instead of out to 20 kHz as claimed. At the faster speed, however, response was measured with ± 2 dB out to 25 kHz. This is still short of the 30 kHz claimed but it still is excellent. Even better response (though not quite to spec) was obtained at both speeds using either the Fe-Cr tape or the SLH tape. Other important characteristics improved too, such as S/N and distortion. Recording headroom was best with Fe-Cr tape, permitting a +8 dB level for 3% THD as compared to a +6 dB level with SLH tape or with standard tape.

Wow and flutter measurements were exceptionally fine at either speed, better than claimed. Fast wind time in our tests was 10 seconds better than specs; speed accuracy was a bit better than claimed; other characteristics and features confirmed as represented. The deck in general impressed MR's testers with its rugged construction, smooth, reliable operation, and the effectiveness of its phase-compensating circuitry.

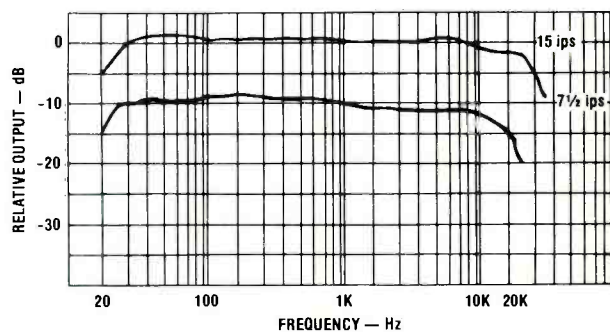
General Info: Supplied in walnut-finish wooden cabinet. Dimensions are 18 $\frac{3}{8}$ inches wide; 20 $\frac{1}{4}$ inches high; 10 $\frac{1}{2}$ inches deep. Weight is 80 lbs., 6 oz. Owner's manual is excellent. Advertised price: \$2,495.

Individual Comment by N.E.: The generous signal headroom and the informative metering system (using the switch provided) of the Sony TC-880-2 could be a great help to the recordist who is concerned about signal levels vis-a-vis tape saturation and dynamic range. The attention to phase linearity in the audio response is commendable in general terms, and specifically so for recording and playback of matrixed four-channel material. Our test results did not actually confirm all of the published specifications for the unit, but the results still indicate top-grade performance at least when using Sony's Fe-Cr or SLH tape. (Could it be that the claim of response out to 40 kHz within ± 2 dB is a typographical error?) Everything on the deck worked "as claimed" and indeed the feel of the controls was truly excellent. Whether the TC-880-2 should be classed as a pro deck or a very sophisticated high-performing advanced home-user deck may be a nice question to debate, and so too—for the prospective buyer—may be its asking price.

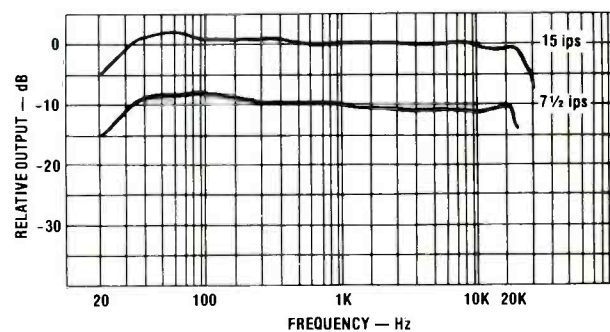
Individual Comment by L.F.: We made several readings of wow and flutter on the TC-880-2 to be convinced that the reading obtained was indeed the very low 0.015% WRMS shown in our "Vital Statistics" table. Obviously, the combination of direct drive and dual-capstan results in tape motion as good as what may be found on pro machines costing much more than this one does. We also were impressed with the three-way metering system and with the deck's ability to

reproduce four-channel matrixed program material (thanks to its phase-compensating circuitry) which, when decoded via an external decoder, did produce better and more stable sound, especially with SQ-encoded music.

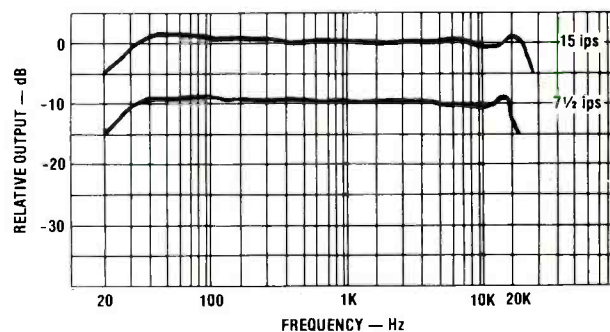
There is no provision for mic/line mixing although a brochure from Superscope (which distributes Sony tape machines in the U.S.) lists this as one of the features. There also are some discrepancies in the response specified, with the owner's manual (printed in Japan) making more conservative claims than the brochure. Be that as it may, some of the other things about the deck I especially liked were its option for using Cannon as well as standard phone plugs for balanced inputs for microphones; the punch-in recording facility and the reel-rocking option; the variable pitch



Sony TC-880-2: Record/play response, using Sony PRO-150 tape (STD). Bias = normal; EQ = normal.



Sony TC-880-2: Record/play response, using Sony SLH-180-36 tape. Bias = normal; EQ = special.



Sony TC-880-2: Record/play response, using Sony Fe-Cr-11-1100 BL tape. Bias = normal; EQ = Fe-Cr.

feature (particularly useful if you use this deck in playback as part of a mixdown system in which "live" instruments or recordings made on machines having poorer speed accuracy are combined); and the real-time indicator.

I had mixed feelings about the 2 dB/step increments of the record and playback level controls. While a handy thing that lets you know where you are, there may be times when one wants to work in 1 dB or less increments of level change and while this is possible with the playback vernier control, it is not possible to "vernier" the record-level control in smaller increments of adjustment. The variation we encountered in performance capability (S/N and frequency response) between the three sample grades of tape supplied with the deck seemed greater than should be expected from an open-reel deck, particularly at the 7½ ips speed.

In sum, if you use this deck and are serious about recording, my advice is to stick to the low-noise or ferri-chrome tapes—that's when its performance really comes through. On the question of the machine's price tag, I also have mixed feelings. From the standpoint purely of audio performance, \$2,500 may be high in comparison with other tape recorders. However, that price may not be unreasonable in view of the splendid transport and its mechanical sophistication, which

provides the kind of action one normally encounters only in a true professional machine.

SONY TC-880-2 TAPE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Record/playback frequency response	
15 ips, std tape	±2 dB, 25 Hz to 25 kHz
SLH tape	±2 dB, 25 Hz to 27 kHz
Fe-Cr tape	±2 dB, 25 Hz to 26 kHz
7½ ips, std tape	±2 dB, 21 Hz to 16 kHz
SLH tape	±2 dB, 25 Hz to 21 kHz
Fe-Cr tape	±2 dB, 25 Hz to 20 kHz
Harmonic distortion	
0 VU, std tape	0.9%
SLH tape	0.55%
Fe-Cr tape	0.32%
+3 VU, std tape	1.4%
SLH tape	1.0%
Fe-Cr tape	0.55%
Recording level for max 3% THD	
Std tape and SLH tape	+6 dB
Fe-Cr tape	+8 dB
Best S/N ratio, std tape	56 dB
SLH tape	60.5 dB
Fe-Cr tape	65 dB
Input sensitivity, mic	0.22 mV
line	35 mV
Output level, line	0.40 V
headphone	1 V at 8 ohms
Bias frequency	160 kHz
Speed accuracy	±0.4%
Wow & flutter (WRMS), 15 ips	0.015%
7½ ips	0.025%

CIRCLE 19 ON READER SERVICE CARD



Yamaha C-2 Preamplifier

General Description: The Yamaha model C-2 stereo preamplifier-control is a unit for use in a high-quality playback system and in some studio applications. Circuitry boasts some fairly sophisticated design features such as the use of vertical FET's in matched pairs said to be literally custom-built for the device. The equalizer section uses "super low-noise" FET's in a "cascode bootstrap" circuit (patented). Tone controls have true "defeat" at zero settings so that tone circuits are completely disconnected to allow the C-2 to function as a perfectly flat device. When used, the turnover frequencies for bass and treble are set at 350 Hz and at 3.5 kHz, respectively, which, in MR's view, are a more meaningful pair of frequencies at which to begin tonal compensation than the usual 500 Hz or 1 kHz pivot points commonly found in preamps.

The C-2 is styled in a low profile, colored black, and

may be installed in any convenient manner. Front panel controls include a power off/on switch; bass tone control knob; treble tone control knob; subsonic filter switch; mode selector (with positions for mono left, mono right, mono left plus right, normal stereo, and reverse stereo); a tape selector (with positions for play B, play A, source, and record cut-off); input selector (with positions for auxiliary, tuner, phono 1, phono 2, and mic); audio muting switch (offering 20 dB cut in signal level); and a concentric pair of knobs to handle volume and channel balance.

All input and output connections are at the rear, arranged in stereo pairs. Included are inputs for the sources indicated on the selector switch; inputs for signals from two separate tape recorders, plus outputs for two recorders; and two pairs of main preamp outputs. Three convenience AC outlets are provided, two of them switched from the front panel. Two grounding

posts and the AC line cord complete the picture here. All signal connectors are standard "pin jack" types. The C-2 is rated to draw 25 watts from a 120-volt line (50-60 Hz).

A muting circuit keeps the C-2 silent for a few seconds after turn-on to prevent possible noises. The AC outlets at the rear are not designed to handle really heavy-power demands such as encountered with high-powered basic amplifiers which should be connected to their own main AC outlets. The AC outlets on the C-2 will accommodate such units as tuners and turntables.

The phono preamp section has ample gain and response characteristics to handle a low-output moving-coil phono pick-up without the need for an intervening step-up transformer. The tape selector arrangement chooses playback from either of two tape decks but does not provide for direct dubbing from one deck to the other.

Test Results: In general, and in all vital respects, the Yamaha C-2 met or exceeded its published specifications. Possible exceptions (and MR allows that these could be due to normal variations in test instrumentation) were a slight roll-off at 100 kHz (which really need concern no one from a practical standpoint), and a slightly less sensitive phono input rating than claimed (2.3 mV as compared to the stated 2.0 mV). On the other hand, phono overload was better than claimed (320 mV measured; 300 mV specified); hum and noise were down by 86 dB on phono as against the 85 dB claimed; THD was measured as 0.0023% with 0.003% claimed; maximum rated output was 12 volts as compared to the 10 volts specified.

In listening tests the C-2 offered unexcelled performance in terms of audio purity. Transient response was impressive, as was signal-to-noise behavior at all level settings up to "wide open." Even when switched to phono, and with no input signal fed in, no background noise could be heard. In general, MR's testers felt the C-2 offered a measure of sonic transparency, ultra-quiet operation, and dynamic range that were truly outstanding.

General Info: Model C-2 preamp is 17 $\frac{1}{2}$ inches wide; 12 $\frac{1}{2}$ inches deep; 2 $\frac{1}{2}$ inches high. Weight is 17 lbs., 3 oz. Advertised price is \$650. Owner's manual, while stressing unit's design and circuitry, is complete from the standpoint of correct operation.

Individual Comment by L.F.: Examining many of the high-priced separate preamplifier-control units that recently have entered the market, it seems clear that they fall into two general categories. One would be the "do everything" preamps replete with controls such as high and low filters, variable turnover tone controls, versatile tape monitoring and dubbing options, and so on. An alternate approach to the design of a preamp avoids these features, and some models even omit such "standard" items as tone controls altogether.

In my opinion, the Yamaha C-2 falls about midway between these two extremes and strikes me as a well-conceived design that should please both the knob-twirler and the "audio purist" who seeks the closest thing to a "straight wire with gain" that can be found.

The use of FET's in a power amp may be a subject of debate, but my experience with their use in this preamp suggests there can be little argument about their ability to provide unrivaled performance in preamp applications. The C-2's dynamic range is greater than that of any other preamp in its price class that I have measured. Consider also the signal-to-noise ratio measured at the moving-coil phono cartridge input. Rated S/N is 70 dB (IHF "A" weighted), referred to an input level of only 50 microvolts (0.05 mV). That figure would be commendable even if applicable to the moving-magnet phono cartridge inputs of most preamps. I also like the true "defeat" position of the tone controls, as well as their bass and treble turnover frequencies. The preamp's subsonic filter (cut-off at 12 dB per octave below 15 Hz) is one of the few such filters I have used that actually improves, rather than impairs, musical performance in the presence of ultra-low-frequency turntable rumble; it prevents a woofer cone from making those wild, wide excursions outside its linear operating range.

Since the C-2 can be used with other equipment that has an input impedance of 600 ohms, interface between the C-2 and professional recording units such as mixers and tape decks is possible. And while the preamp output reaches 12 volts before significant distortion occurs, the output at the tape-record jacks reached 18 volts for the same distortion levels. In this sense, the C-2 would not likely ever become a limiting factor insofar as usable headroom is concerned.

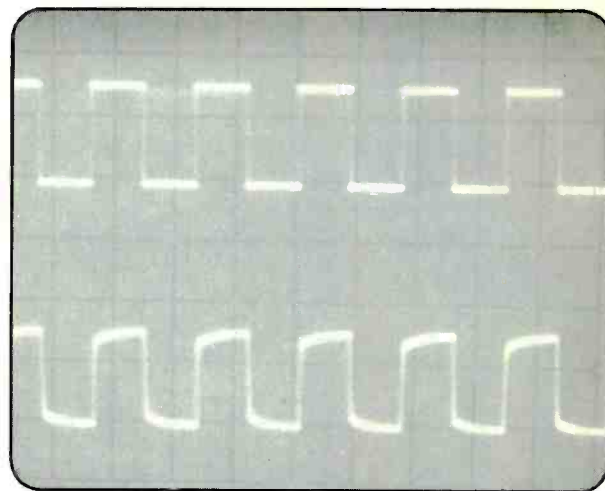
One might argue with Yamaha's decisions as to which controls have been included or omitted on the C-2, but once the system is set up and operating there will be little debate over the quality, transparency, or balance of the reproduced sound—assuming that the source material and the other associated components are of the high quality of the C-2.

Individual Comment by N.E.: That the C-2 preamp is an eminently clean audio system "front end" cannot be denied. Teamed up with a suitably high-quality power amp (such as Yamaha's own model B-2, for one) and with high-quality source material feeding the system, you get a feeling of utter transparency, of listening "through the system" rather than to it. I must add, however, that this is not the only unit of this type to give me that feeling.

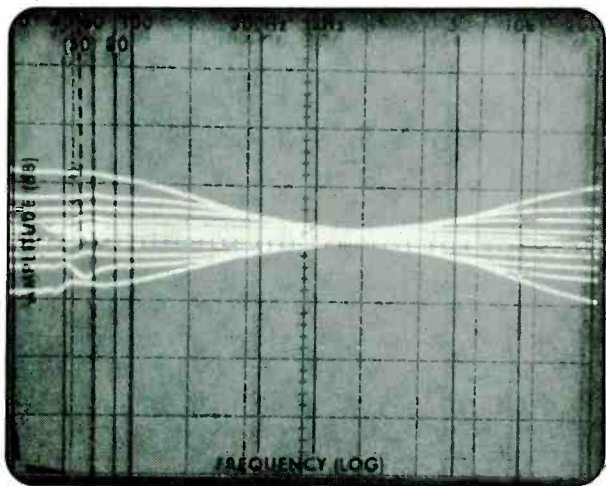
Be that as it may, this superb listening quality suggests that the C-2's primary appeal is to the audio perfectionist who is more concerned about sonic purity than ultimate system versatility. One can commend the excellent action of the tone controls, for instance, while at the same time questioning the fact that they are not individual-acting per channel—that is, both the treble and bass knobs handle the two stereo channels

simultaneously. The subsonic filter is excellent, but why is there no high-cut filter? The tape selector arrangement does not make for direct dubbing from deck A to deck B. Interface with studio-type units would require for many pro users some cable adaptation since all the outputs and inputs on the C-2 are "hi-fi" pin-jack types. The signal output available at the tape feed jacks is considerable, and an 18-volt level before distortion does bespeak great circuit design, but what tape deck input needs that much signal? The moving-coil phono input is another electronic marvel—for those who use moving-coil pick-ups, which are a fairly small part of the overall pick-up scene.

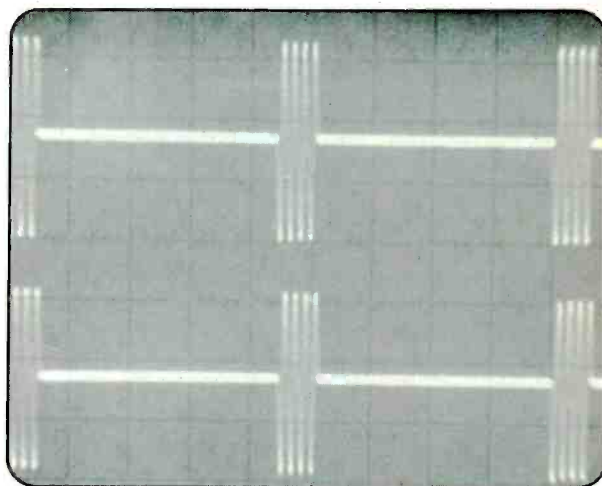
In short, it seems the C-2 has a lot going for it in what might be called specialized terms, and it probably will appeal to a definite kind of critical user who is mostly a listener. The serious audio activist may find its options and features somewhat less than ample for many applications.



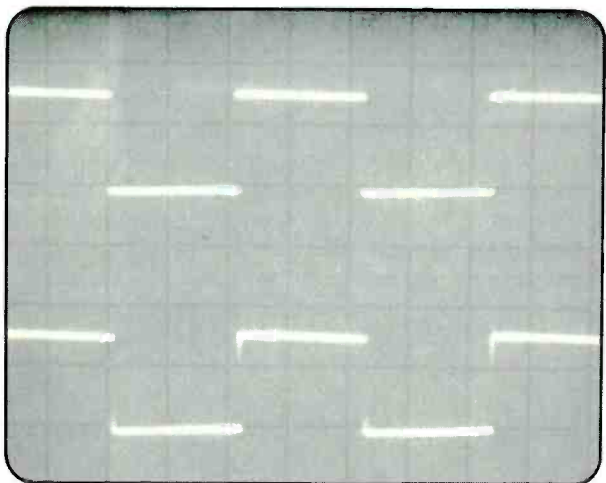
Yamaha C-2: 10 kHz square wave response (upper trace is input signal).



Yamaha C-2: Tone control range.



Yamaha C-2: Tone burst response (10 kHz sine waves in burst); upper trace is input signal.



Yamaha C-2: 100 Hz square wave response (upper trace is input signal).

YAMAHA C-2 PREAMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Input sensitivity, phono (mag/MC)	2.3 mV; 56 μ V.
aux	120 mV
tuner	120 mV
tape	120 mV
Phono overload (at 1 kHz)	320 mV
Hum and noise, phono, "A" weighted (mag/MC)	86 dB; 73 dB
aux	100 dB
tuner	100 dB
tape	100 dB
THD at rated output (7.75 V)	0.0023%
IM at rated output	0.009%
Maximum output	12 V
Frequency response, high-level	5 Hz to 85 kHz, +0, -1.5 dB
RIAA characteristic	within ± 0.2 dB

CIRCLE 10 ON READER SERVICE CARD



Sound Workshop Model 242A Stereo Reverb

General Description: The model 242A by Sound Workshop, Inc. is a "second generation" product (its predecessor was the model 242). Designed to interface into any audio system (pro or semi-pro studio, P.A., sound reinforcement, hi-fi, broadcast, or disco), the device offers an impressive array of options and features. The front panel contains two push-switches for power and for input mix, plus six knobs: two for left and right inputs (each with a peak LED indicator); two for reverb level; and the last two for left and right channel equalization.

Six connections (standard ¼-inch phone jacks) at the rear provide for mic and line inputs on each channel, and for left and right channel outputs. Also at the rear are a toggle switch for the dry signal (off/on) and the unit's AC line cord.

When both a mic and line inputs are connected to the same channel, only the mic input will operate. However, the unit will accommodate a mic in one channel and a line input in the other, with each channel functioning in its normal operating mode. The input mix is an active circuit so that a mono composite signal may be fed to both delay lines, thus allowing a stereo reverb signal to be created from a mono or a mixed input. The EQ controls may be used to adjust the tonal character of the reverberant signal at 4,300 Hz (the so-called presence range) to suit the musical situation.

The rear-panel dry-signal switch allows the dry input signal to be sent to the outputs, allowing a dry/reverb mix to be adjusted by the reverb-level knobs, with the operating controls having no effect on the dry signal. In other words, with the dry-signal switch "off," the 242A functions as a normal reverb device: a dry signal goes in, and a wet (reverberant) signal comes out. What is sent to the device and how its output is used would be controlled, of course, by the echo-sends and returns of any associated console or mixer. With the dry-signal switch "on," the 242A still functions as a normal reverb, but this time all send and return functions are controlled by the 242A itself.

The unit may be rack-mounted if desired (standard 19-inch front panel with mounting holes) or simply placed on a table or cabinet top. The instructions furnished with it are adequate, and contain a thoughtful paragraph that points out that while the 242A is a high-quality "thing," it should be regarded as a tool—the musical and creative uses of which depend on the operator's creativity and experimentation.

Test Results: The 242A uses a spring mechanism for the delay effect, but the manufacturer claims that the carefully designed circuitry (equalized drivers and

preamps) eliminates undesirable spring noises. Accordingly, this aspect was one MR especially tested, mindful of previous spring-type reverb systems which generally exhibited the characteristic twang of the mechanism at all but minimal settings of the reverb control.

Happily, we can report that this objectionable distortion was not present when using the 242A. We had a "live" guitarist "doing his thing" while we used the 242A, varying its controls over their full available ranges. It was not only possible to precisely regulate the amount of reverb added to dry signals, but even with the reverb used at maximum, there was not the slightest audible evidence of "spring twang." Of course, if the device is jarred accidentally, it will produce that thunderous low-frequency rattle common to this general class of reverb unit. But protected from such jarring, the 242A does its job cleanly and effectively.

Related to the fine way the 242A performed is the frequency contouring it offers. If lifelike "hall reverberance" is to be achieved, the highs above about 5 kHz must be carefully rolled off, and in MR's experience, spring reverbs in general could neither maintain flat response to 5 kHz nor provide the desired roll-off beyond that frequency. However, the 242A comes through on both counts—verified in use tests and in instrument measurements, as illustrated in the accompanying response photos. The superimposed response curves, plotted by a slow-sweeping frequency generator and a spectrum analyzer storage 'scope, show how very closely the reverb response follows the required frequency contours. To be sure, many resonances and sub-resonances do show up along the way, but they are so narrow in bandwidth that they are effectively wiped out; that is, the ear does not detect them as a discontinuity in the overall response spectrum of interest.

In other audio measurements, most of the unit's published specs were confirmed, except for the range of equalization (specified as ± 15 dB; measured as ± 9 dB), but even this was felt by MR's testers to be effective in providing a substantial change in reverb "coloration." The front-panel LED's were judged a great convenience, and did prove useful in warning of overdrive of the input levels. Input level range, by the way, was not too critical and overdrive occurred in only a few instances.

General Info: Supplied in integral metal case, with brown matte finish and four small rubber feet. Front panel dimensions are 19 by 3½ inches; depth behind

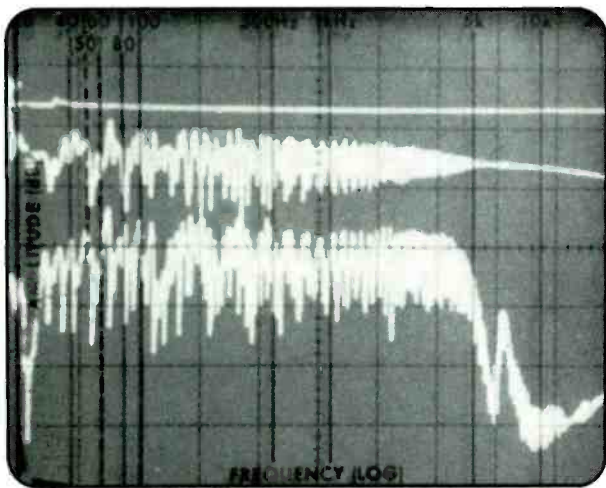
panel is 8¼ inches. Weight is 11 lbs. If unit is installed on its rubber feet, overall height becomes 3⅝ inches. Price: \$450.

Individual Comment by L.F.: The actual signal output of the 242A impressed all who heard it; this is definitely a superior spring reverb and apparently the attention to internal circuitry claimed in the literature has paid off in terms of a “twang-less” reverb at all output levels. The dry-signal option—which permits any ratio of dry-to-reverberant signal to be mixed at the output—is a definite plus when the device has to be used where echo-sends and returns are not available on a mixing console, or in such applications as broadcast or disco work. I do feel, however, that this switch should be on the front panel instead of the rear.

While the mic inputs are certainly a welcome feature on the 242A, they cannot be mixed within the same channel with the line inputs. Since most users of such a device are not likely to have to depend on it for mic inputs, perhaps the elimination of the microphone stages could have enabled Sound Workshop to bring the price of the unit down.

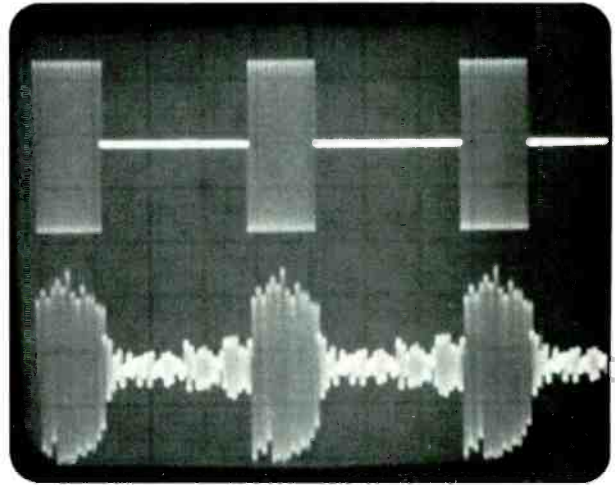
In any event, with all-electronic digital and analog time-delay and reverb units sure to appear at steadily reduced prices (now that the first affordable models are available), the life of the spring reverb may be limited unless something is done to lower its price.

Individual Comment by N.E.: Like many other audiophiles, my first experience with reverbs was with the old spring systems that didn't do much when turned up slightly, but which went to hell when turned up appreciably—like injecting the acoustics of the Grand Canyon into a musical signal when all you wanted was a feeling of a reasonable-sized hall. The 242A is a far cry from those earlier devices; it is a spring system, but obviously one on which a great deal

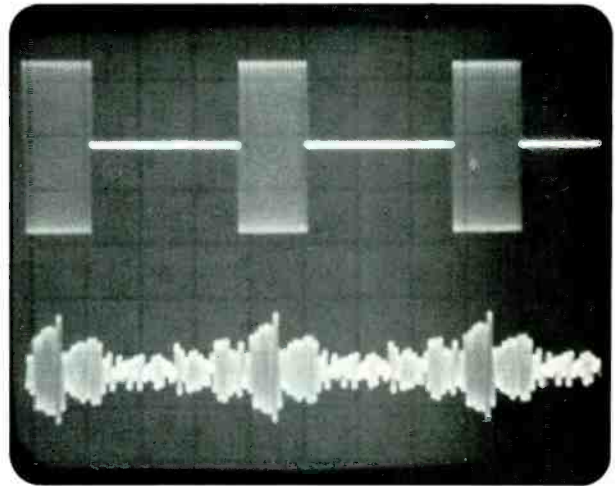


Sound Workshop 242A: Upper trace shows “dry signal” response from 20 Hz to 20 kHz. Middle trace shows effect of adding reverb to dry signal. Lower trace shows fluctuating response and roll-off (above 5 kHz) of reverb-only signal.

of refinement—from a musical standpoint—has been lavished. As for the unit's cost, it is, after all, a specialized “extra” sort of device with a “personality” of its own, and with a product of this sort it is difficult to generalize about relative cost from the standpoint of a given buyer.



Sound Workshop 242A: Lower trace shows output when dry signal (upper trace) consisting of 1 kHz tone bursts is added.



Sound Workshop 242A: Lower trace shows reverb-only signal at output when tone burst (upper trace) is applied to input.

SOUND WORKSHOP 242A REVERB: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Line inputs: Impedance	10K Ohms, bridging balanced
Maximum level	+22 dBm
Mic inputs: Maximum level	-20 dBm
Outputs: Impedance	47 Ohms, unbalanced
Max output signal	+22 dBm
Noise level	-73 dBm
Equalization	±9 dB at 4.3 kHz
Decay time	2.5 seconds

CIRCLE 3 ON READER SERVICE CARD



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There has been much talk recently about "envelope followers," "triggered filters," and other electronic devices which produce that funky, touch-controlled wah effect.

Musitronics feels that you should be aware of two important facts about these devices.

Fact No. 1: Mu-tron III was the original envelope-controlled filter; in fact, Musitronics holds the patent on this type of device (U.S. Patent No. 3,911,776).

Fact No. 2: Mu-tron III is still the best. Mu-tron III has more controls and more sophisticated controls than any other envelope follower, allowing the musician a wider range of effects with a wider variety of instruments and playing styles.

In addition, Mu-tron III is very ruggedly built to withstand the hardships of professional use. But just in case anything should go wrong, Musitronics backs up its products with a three-year limited warranty that really means something.

Send 50¢ for Musitronics demonstration record. Features Larry Coryell and George Duke using Musitronics products on guitars and keyboards.

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For those musicians who don't need the versatility and flexibility of Mu-tron III, Musitronics has introduced Mu-tron Micro V.


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Mu-tron Micro V is operated from a single 9-volt battery. A jack is supplied for operation from a standard 9-volt battery eliminator.

The unit is physically very compact and is every bit as rugged and reliable as you would expect a Mu-tron product to be. And, of course, Mu-tron Micro V is covered by the same three-year warranty.

So if only the best will do, it's Mu-tron III—the original.

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GROOVE VIEWS

Reviewed by:
SEDGWICK CLARK
CHAS FARRELL-KIMBRELL
NAT HENTOFF
H.G. LA TORRE
IRA MAYER
STEVEN PEEPLES
GIL PODOLINSKY
HOWARD ROLLER
BOB WEIL
PAULETTE WEISS

POPULAR

THE ALAN PARSONS PROJECT:
Edgar Allan Poe: Tales of Mystery and Imagination. [Alan Parsons, producer and engineer; recorded at Abbey Road Studios, London, England.] 20th Century Records T 508.

Performance: **Front row**
Recording: **Exceptionally creative**

Alan Parsons first came to prominence as assistant engineer on The Beatles' *Abbey Road* album. Since then, he's engineered and produced several Paul McCartney and Wings albums, as well as Al Stewart, John Miles's technically brilliant new album, and the Hollies, among others. In the process, he's won two Grammy Award nominations for Pink Floyd's *Dark Side of the Moon* and *The Ambrosia Album*.

Tales is a concept album, *par excellence*, based on the poetry of Edgar Allan Poe. The idea was conceived by executive producer and co-writer Eric Woolfson, who brought it to Parsons. A year's research was undertaken, and the project was shrouded in secrecy to avoid being upstaged.

Backed by the arranging and conducting genius of Andrew Powell, Parsons was free to create a dimension of sound comparable to the feeling of Poe's poetry. And that he did, using over two hundred musicians, including a Who's Who of Rock. Parsons' crea-

tive engineering is mind-boggling. He is the first to use the Harmony Vocorder, a keyboard synthesizer which processes voices into musical sounds and pitches. Rather than using it as a toy or a gimmick, he wisely and successfully introduces it to the world as the voice in *The Raven*. The tonal colors of the electric bass create the illusion of heart beat in the introduction to *The Tell-Tale Heart*; he then electronically arranges the various sounds around a driving rock bass.

Parsons' use of sound effects are the most realistic I've ever heard. An excellent example is the thunder which climaxes the orchestral movement in *The Fall of the House of Usher*. The measure of success is that upon repeated listening and expecting the crescendo, the mood created is so real



JONATHAN EDWARDS: The back 40.

that you still shudder. The presence in the recording is in a class by itself, a living definition of a clean recording. This is unequivocally a Grammy winner. G.P.

JONATHON EDWARDS: *Rockin' Chair.* [Brian Ahern, producer; Brian Ahern, Bradley Hartman, Stuart Taylor, Donivan Cowart, engineers; recorded in the Enactron Truck.] Reprise Records MS 2238.

Performance: **Naturally polished**
Recording: **Ditto**

Rockin' Chair is Jonathon Edwards' fifth solo album in as many years, and his first with veteran producer Brian Ahern (Anne Murray and Emmylou Harris). For the uninitiated, Edwards is a fine country-folk singer with a distinctively high, clear voice that is a little reminiscent of Jesse Colin Young or Ian Matthews. His first couple of albums, produced by Pete Casperson, featured some good original material in refreshing acoustic settings, but they sounded extremely thin, as if they had been recorded in a totally dead room. Edwards joined Casperson on the production of *Have a Good Time for Me* and *Lucky Day* (recorded "live"), and these albums remain virtually undiscovered treasures. Their sound is rich and present, the material (written mostly by Edwards' Boston cohorts Joe Dolce, Malcolm McKinney and Eric Lillequist) is top-notch and the musicianship of his back-up band, Orphan, is both professional and enthusiastic.

Unfortunately, artistic merit does not insure commercial success, so, despite Edwards' stated preference for the "back 40" vs. "top 40," a change was in order. Enter producer Ahern with Emmylou and her Hot Band in tow. The result is a pleasant, buyable album: Edwards' remarkable voice is well recorded; Miss Harris and friends provide a professional C & W backdrop; the material is uniformly good (except for "The Christian Life" which is just about insipid enough to drive the Pope himself from the fold); and the sound is richer and fuller than any of Edwards' previous efforts.

Still, *Rockin' Chair* lacks the exuberance of Edwards' less commercial works. The mix is just a little too even, the back-up too polished, and the material too consistent, with no real stand-out cuts. Jonathon Edwards is a very personal artist who comes across best in a club with a small band of musician/friends behind him. Let's hope he and Ahern can capture that feeling next time out, but in the meantime we can still settle back into our rockin' chairs and listen to a pretty damn good album. **B.W.**

STEVEN FROMHOLZ: *Steven Fromholz.* [Roger Harris and Don Williams, producers; Peter Nicholls, Chet Himes, Hugh Davies, engineers; recorded at Shelter Church Studio, Tulsa, Okla., Sound City, Los Angeles, Cal., and Odyssey Sound, Austin, Tex.] Capitol ST-11521.

Performance: **Energetic**
Recording: **Multi-leveled**

Fromholz is a multi-leveled creator of music; there is no category with his name on it. As a songwriter, his moods range from demented to crazy to light-hearted to warm and mellow, and as a vocalist his inflections and delivery are true to the feeling of the song.

So it's appropriate that Fromholz's guest musicians—B.W. Stevenson, The Lost Gonzo Band, Willie Nelson and his band of Heathens, Doug Dillard, John Sebastian, and more—are for the most part pulled from Austin's loosely associated "Interchangeable Band," which quite simply plays it all. Their versatility is perfectly matched with the many facets of Fromholz's songs.

And producers Harris and Williams did a pretty clean job on many levels. With so much diverse and multi-leveled talent, it wouldn't be hard to come up with a strong album, but they take care with the mix to keep Fromholz in the foreground. The tracks are uncluttered, crisp and straightforward; the spirit and feeling is bright with a sense of honesty all the way through.

The sound is that of Texas, and it must be remembered that Texas is not only a source of contemporary country music. Fromholz and the guest musicians pull from every music form imaginable, and, if anything, that's the "Austin Sound." You can't get that energetic sound just by taking a bunch

of musicians to Odyssey in Austin. Harris and Williams were well aware of that, and caught the whole spirit on tape; it's probably the best example yet to come from the Lone Star state. **S.P.**



MARVIN GAYE: Filling the void.

MARVIN GAYE: *I Want You.* [Leon Ware, producer; Art Stewart and Fred Ross, engineers; recorded at Motown Recording Studios and Marvin Gaye Recording Studio, Hollywood, Cal.] Motown T 6342S1.

Performance: **The Real McCoy**
Recording: **No compromises.**

It's been a long time since we've had a good, unpretentious soul album, and Marvin Gaye's *I Want You* fills the

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void. His writing collaboration with producer Leon Ware has resulted in an album of tasteful music where the tunes are not based upon one, repetitious disco riff. Ware has done nothing to tinker with the established Marvin Gaye sound: the ever-present percussion, the underlying horns, the cushioning strings—all the aspects of record making synonymous with Gaye. Although I don't feel that making two out of nine cuts instrumentals in order to gain disco appeal is necessary to sell a Marvin Gaye album, Ware was smart in that regard by re-cutting two vocal tracks, and doing the same tunes over, only substituting synthesizer for Gaye's voice. As a result, Ware has assured a lively, consistent product. The production is first-class, with no audible compromises between artist and product. This album will definitely set a standard to which other soul/disco/funk records will have trouble measuring up. G.P.

WAYLON JENNINGS, WILLIE NELSON, JESSIE COLTER, TOMPALL GLASER: *The Outlaws*. [Al Pachuki, Leslie Ladd, Tom Pick, Bill Vandervort, engineers.] RCA APL1-1321.

Performances: **Economical**
Recording: **Ungimmicked**

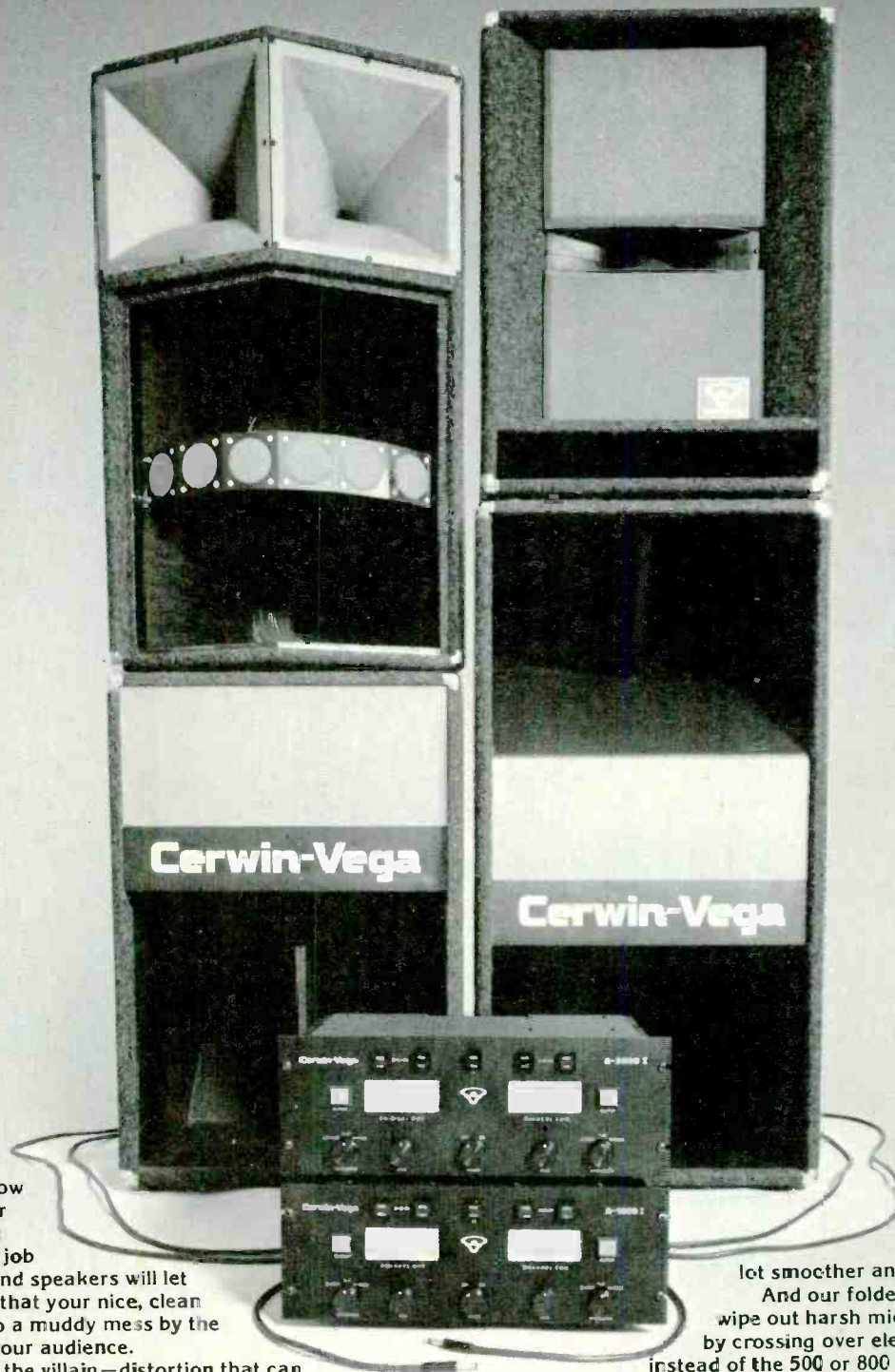
WILLIE NELSON, FREDDY FENDER, ASLEEP AT THE WHEEL, BOB WILLS AND HIS TEXAS PLAYBOYS: *Texas Country*. [Tommy Allsup, Joe Allison, producers.] United Artists LA 574H2.

Performances: **Texas C & W at its best**
Recording: **Historical**

Contained in the six sides of these albums is an intelligent collection of mostly previously released material by the main progenitors and developers of country-oriented Texas music. The cross-pollination of country, blues, swing jazz, gospel, rock, and Tex-Mex has been underway since the first commercially available recordings back in the Twenties. The resultant hybrid sound is at once distinctive and indescribable, which is usually the case when individual parts contribute to create a greater whole.

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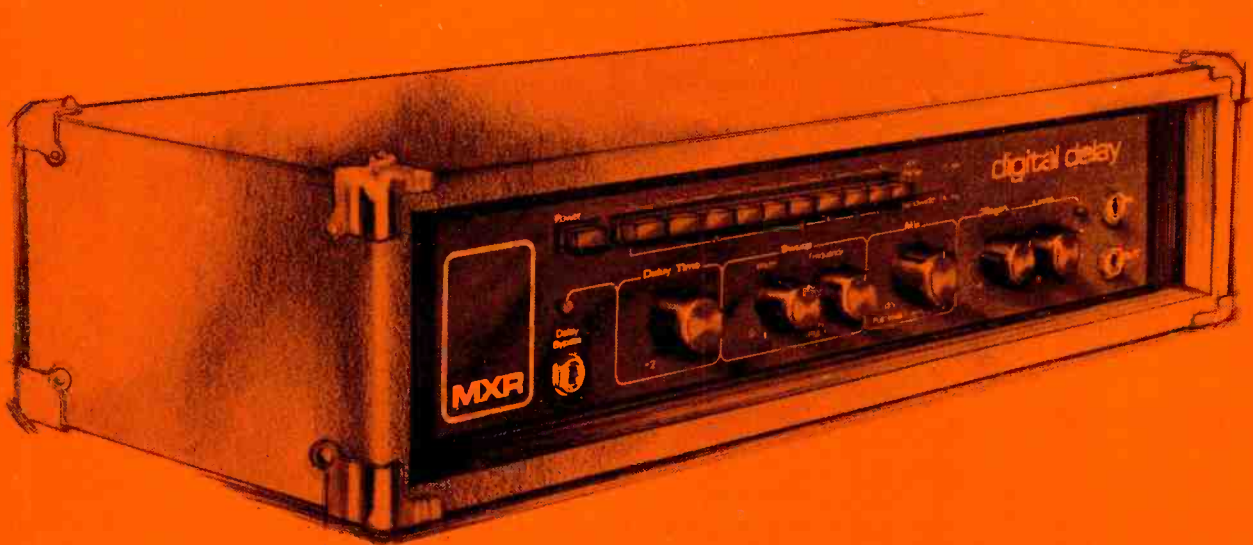
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sympathetic to Nashville's status quo to label them "outlaws" a couple of years ago. These artists, for the most part, have subsequently made their name outside Nashville's feifdom, and only recently they have been grudgingly recognized for their contributions to music by Nashville's feudal lords. That same rebellious spirit has caught the attention of young listeners, who are beginning to realize they have something in common.

The Outlaws contains the most recent material of the two samplers and evidences a refreshing lack of over-production relative to standard contemporary Nashvillian pop-out records. It is clean, solid and whole, and includes a couple of previously unreleased tracks, one of which features a Waylon/Jessie duo on "Suspicious Minds."

While *The Outlaws* is more current, the UA double package is a collection of older tracks with historical import to those desiring to trace Texas music's diverse roots. One side is devoted to each of the four artists.

Nelson's side contains older tracks of songs he composed for top country artists some 20 years ago, including "Hello, Walls" and "Night Life." His

most recent versions of those songs are not sweetened with weeping steel and syrupy strings, but the older versions still are cleaner on that score than one might expect.

Some of Bob Wills's most recognized tunes from the Forties and Fifties—like "Faded Love" and "San Antonio Rose"—are included to outline the impact the King of Western Swing had on later artists; Nelson and Jennings are only two such musicians. Allsup's production on Wills's side is at its best—which is understandable because Allsup played guitar with the Playboys behind Wills during the late Fifties up until Wills's last album before his death in 1972.

Asleep At The Wheel, in this decade, has blended western swing jazz with country and blues to develop their own distinct hybrid. Allsup's understanding of the form contributed to the authenticity of AATW's Wills-inspired swing/jump numbers. These tracks were released when the group was still unknown and rather hungry.

The Freddy Fender side contains his 1959 Liberty version of "Wasted Days and Wasted Nights," complete with Sam Phillips/Sun Records tape echo and Fats Domino's rhythm section

providing funky 12/4 back-up. His 1975 version pales when played back-to-back with this version. S.P.

BILLY JOEL: *Turnstiles*. [Billy Joel, producer; John Bradley, Don Pulse, Bruce Botnick, engineers; recorded at Ultra-Sonic Studios, New York, N.Y., Columbia Recording Studio, New York, N.Y., Caribou Ranch, Nederland, Colo.] Columbia PC 33848.

Performance: "Live" and kicking
Recording: **Appropriate**

This album has tempted fate in several regards and has pulled it off as though it were a common occurrence. First of all, it's rare when a record which has been conceived in three studios doesn't, shall we say, show stretch marks in continuity? That's not the case here. The continuity is very strong, with the layered approach of doing basic tracks at one studio, orchestral arrangements at another, and overdubs and mixing at a third, proving for an interesting concept.

Joel doesn't stop there. Put on the first track and—what's this! Early '60's, Phil Spector-type production,

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characterized by the booming, predominant drums and crisp castanets. It's the Shirelles, no, the Ronettes. Billy Joel? The production fits perfectly with the material, "Say Goodbye to Hollywood."

Unlike most artists who produce themselves, Joel is in total accord with the role of producer. He knows when to abandon an idea for the sake of the success of the album. In short, he's not heavy-handed with delusions of grandeur. That's not to say he's lacking in talent. Not true, for his melodies and lyrical content give him away as a light about to shine. No detail seems to have gone unnoticed. For example, the Fender Rhodes electric piano, the staple and most tired keyboard sound in music, is used but twice, and in each case in an imaginative way. This album will long stand as one to which others are compared. G.P.

PAUL McCARTNEY & WINGS: *At the Speed of Sound.* [Paul McCartney, producer; Pete Henderson, engineer.] Capitol/MPL SW-11525.

Performance: **Engaging**
Recording: **Excellent**

Paul McCartney, whose recent concert tour of the U.S. with his group Wings has been a well-deserved success, is not just a pretty face. *At the Speed of Sound* reaffirms his stature as talented musician and composer, sophisticated performer, and capable producer. Chock full of irresistible melodies characterized by a carefully crafted simplicity, *Speed* is a thoroughly engaging album.

McCartney is beginning to exhibit a panache in production equal to his skill as composer/performer. He has an uncanny ear for the interesting electronic effect that gives scope to the melody yet retains the illusion of simplicity. Listen, for instance, to the electric piano shimmering back and forth from left to right channels on "Wino Junko," an effect particularly spectacular when heard through headphones, yet an integral part of the song as a whole. However, unlike recordings in which the producer insists on exhibiting his prowess with electronic gimmickry on every cut, these effects are used judiciously, so that the simple arrangement of solo voice and piano on "Warm and Beautiful" emerges clear, clean and untrammelled. McCartney's ability to accurately



PAUL McCARTNEY: Not just a pretty face.

assess the capabilities of his vocalists and provide compensatory musical and electronic assistance is also an important part of this album's success. He knows when a voice can bear the melody unembellished, and so often places his fine one in the foreground. When the voice cannot, as in the case

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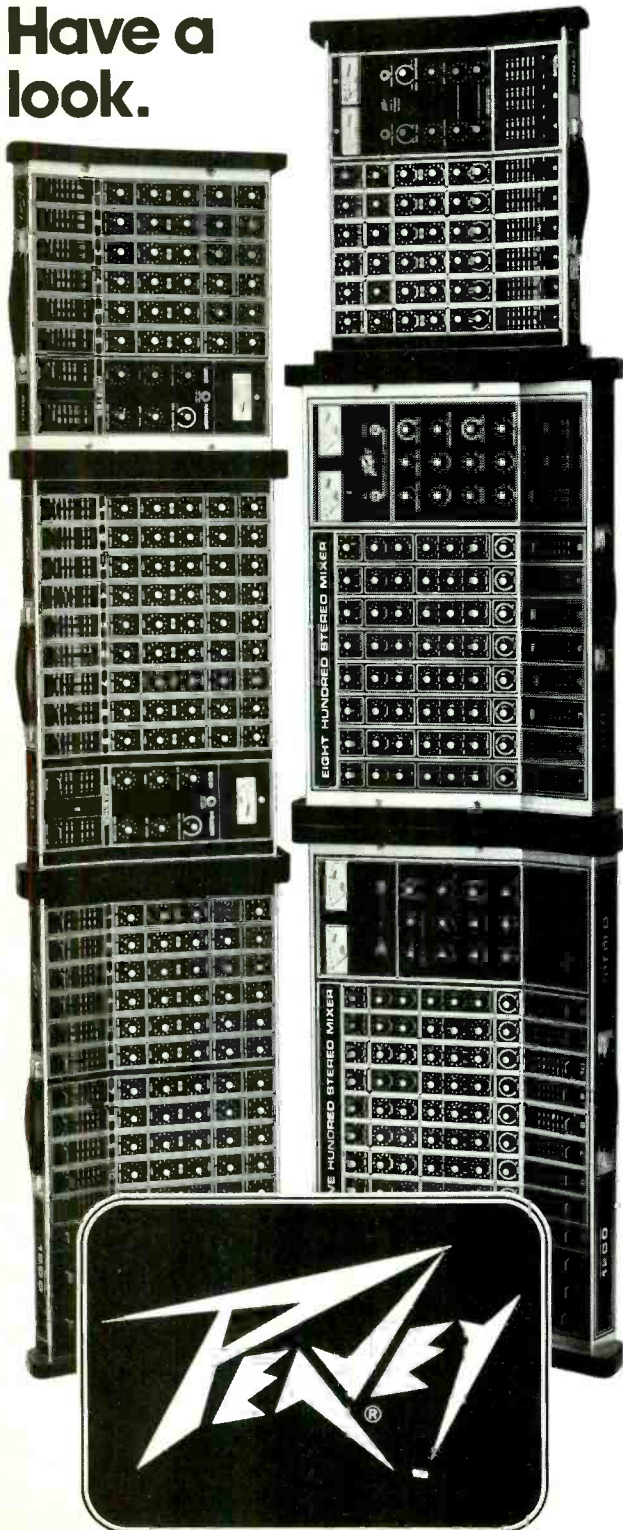


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of the lovely Linda on her solo "Cook of the House," he artfully covers her limitations with a muted midground placement and the addition of reverb, and provides similar aid for other Wings members as necessary.

Engineer Pete Henderson has met McCartney's requirements admirably. On all levels this is a professional, bright, arresting piece of work. Once again the ancients are proved wrong; with a good set of Wings, man *can* fly.
P.W.

BOB MARLEY & THE WAILERS:
Rastaman Vibration. [Bob Marley & the Wailers, producers; Syl Morris and Earlrol Thompson, engineers; recorded at Harry J. Studio and Joe Gibbs Studio, Kingston, Jamaica.] Island (LPS-9383.

Performance: **Up-tempo and unpretentious**
Recording: **Natural, "live" sound**

Rastaman Vibration is Bob Marley & the Wailers' fourth state-side release, and yet it is only with *this* release that they are starting to gain any major notices—a perfect example of the fact that talent by no means equals popularity.

As one of the most dynamic performers in popular music today, Marley's "live" performances are a lesson in audience and musical control; he is always in charge.

Although *Rastaman Vibration* represents the debut of Marley & the Wailers as producers (without assistance), it does not represent a great change in final sound quality. There does seem to be a difference, however, in the dynamic range of this album when compared to the earlier efforts. This one seems smoother, not so "hot." Differences in compression techniques either in the studio or at the mastering plant could be the reason for the change in sound.

This LP has more of an R & B feel than the first three—especially the "Rat Race" and "Night Shift" tracks—but this is still solid reggae. It is not a bland commercial effort done in an attempt to gain a larger audience. There *is* a more positive, happier approach on the album, and Marley's high-pitched urgings have calmed down somewhat. All of this might be viewed as leaning toward the commercial side, but when a performer enters into a period of greater recognition,

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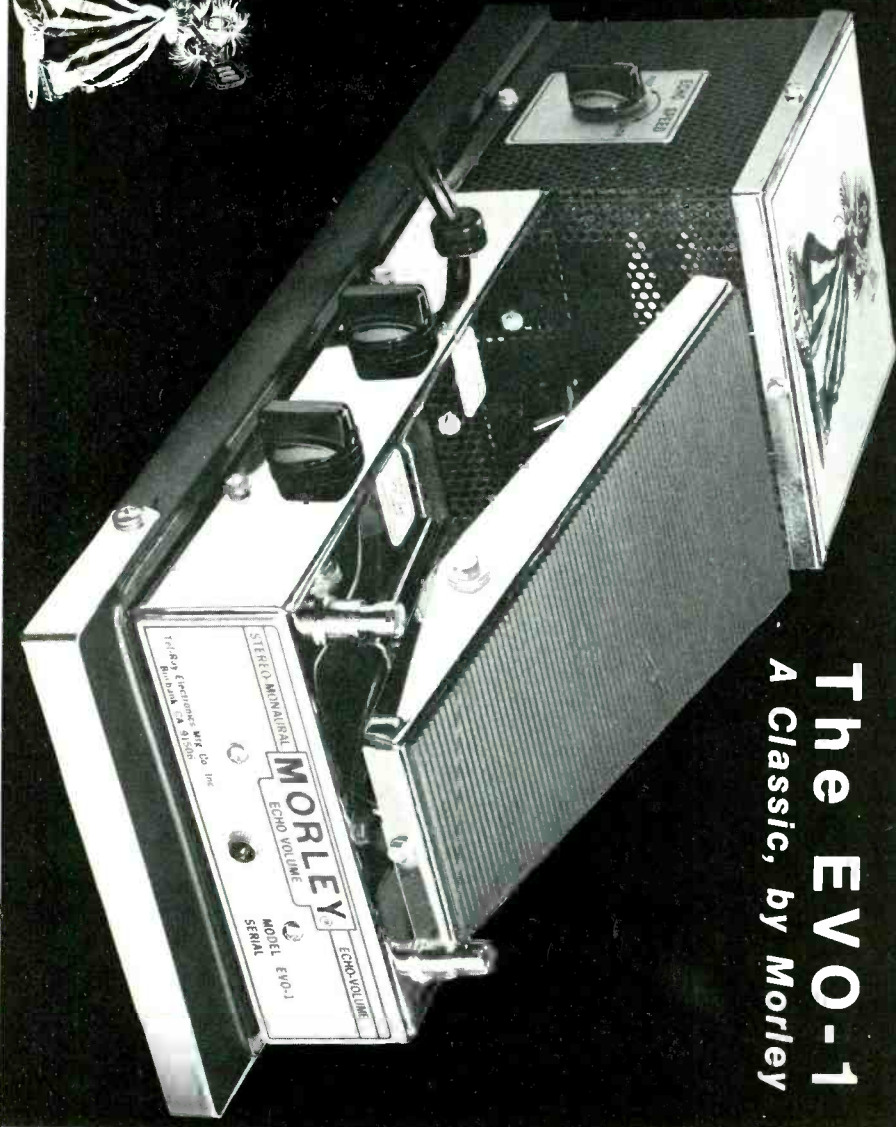
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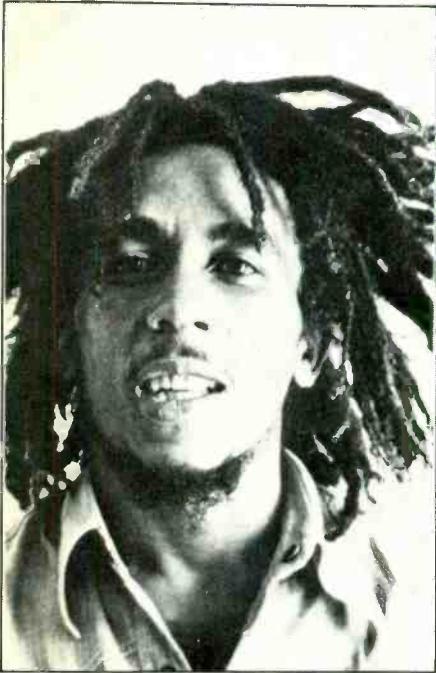
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Certainly one of the major reasons slowing Marley's efforts to break out



BOB MARLEY: A reggae gem.

in the American market have been his sparse use of lead guitar work that has become standard fare (most of it overbearing, flashy and loud) for most English and American bands. After all, when was the last time you heard someone say he wanted to be a rhythm guitarist? Also, reggae is still "foreign" music to most Americans who, notorious for their staid musical attitudes, have only recently begun to accept jazz and, more recently, Latin rhythms as an integral part of the music scene. No more than two months ago, I had to search for a Wailer's album in the back room of a record shop under the category "Folk-songs-Caribbean."

Given a chance, reggae, especially that of Bob Marley and the Wailers, could easily become that specific sound in music by which a decade is remembered. In essence, the sound of the seventies. *Rastaman Vibration* will certainly help that chance to grow.

H.G.L.

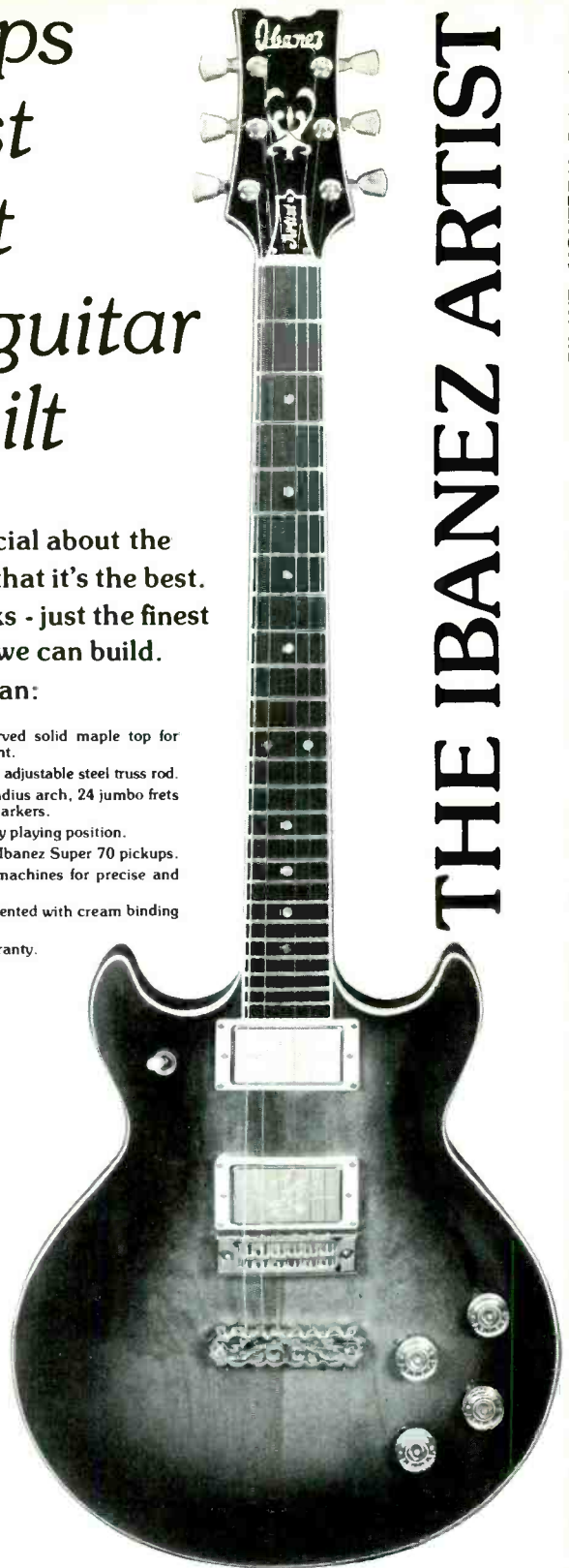
BILLY JOE SHAVER: Billy Joe Shaver. [Bob Johnston, producer; Sam Whiteside, engineer; recorded at Capricorn Sound Studios, Macon, Ga.] Capricorn CP 0171.

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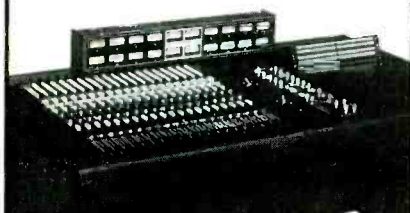
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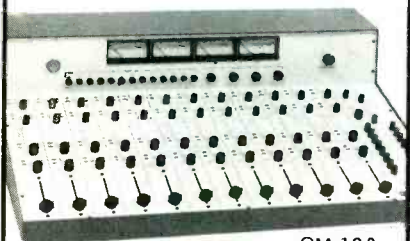
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Performance: **Soulful**
Recording: **Honest, at times raw**

Brother Betts calls Billy Joe Shaver the best songwriter in contemporary country music. That may be a value judgment, but he says it from the heart. Betts picks from the hip, and Shaver writes from the heart. It's really hard to say who's best, but Shaver sure as hell is close to it if there is such a thing.

Billy Joe was leaning up against one of those oppressive Music Row offices in Nashville when Bobby Bare found him. Waylon Jennings recorded an entire album of Shaver tunes back in '73 entitled *Honky Tonk Heroes*, and Kristofferson produced a Shaver solo album for Monument that year entitled *Old Five and Dimers Like Me*.

That album had a rawness to it that was true to Shaver's maverick bull-ridin', lumberjackin' honky tonk carousin' spirit—the rough edges were almost painstakingly left intact. It was a maverick production for Nashville during those days, but Kristofferson knew through his own recording experience that the best way to get a songwriter like Shaver on tape accurately was to focus on the songs, lyrics and vocal coloration.

Producer Bob Johnston deserves credit for that same song-oriented attitude on Shaver's second album. That honesty and rawness is well-preserved. However, the noise level probably could have been reduced somehow (without Dolby), especially on some of the higher-energy rock 'n' roll num-

bers. On the whole, the rawness fits Shaver's artistic approach like a glove, 'especially on some of the more acoustic numbers. S.P.

THE TUBES: *Young and Rich*. [Ken Scott, producer; Ed E. Thacker, engineer; recorded at A & M Studios, Hollywood, Cal.] A&M SP-4580.

Performance: **Fresh and Tasteful**
Recording: **Razor-sharp**

With this, their second album, The Tubes have come of age. The first album was a bit lifeless unless one had seen the act perform. *Young and Rich* is strong enough to stand alone. It creates excitement even without The Tubes's heavy visual performance.

Solid musicianship, coupled with tasteful production, clean engineering and a fresh attitude seems to be the formula which makes this album different. The difference starts with producer Ken Scott. Scott, whose credits include engineer for Bowie's *Ziggy Stardust* album, producer for Stanley Clarke's new album and a nomination for a Grammy for the production of Super Tramp's first album, has included a set of technical liner notes on the inside sleeve of the album covering miking techniques used on various instruments and voices, mixing techniques and other valuable information. Jack Nitzsche was called in to do the arranging for "Don't Touch Me There," a Sixties à la Ronettes tune re-



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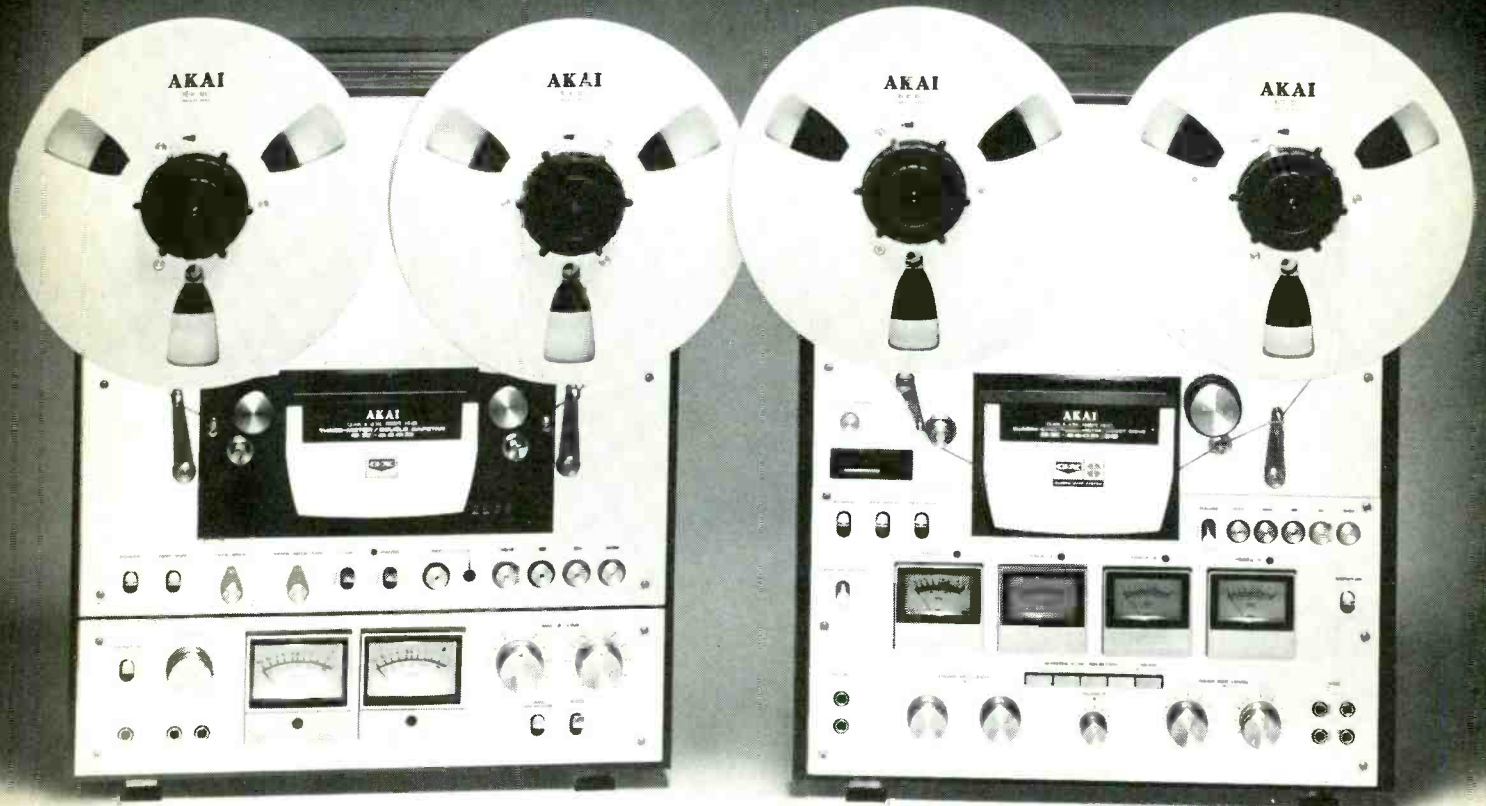
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quiring the Spector touch (hence Nitzsche). Arranger David Paich, currently touring with the Boz Scaggs band in which he plays keyboards, was on hand to arrange a few tunes—the most striking of which is “Pimp,” orchestrated and conducted by Paich.

Even though the musicians display a variety of styles and moods, there is no loss of continuity. The album sound is smooth throughout, which is probably due to Ken Scott knowing his job and doing it. Every time the musicians’ style or mood changes, Scott’s production changes with it. Scott watched

the act perform “live” and on video tape before attempting to produce them; Al Kooper, on the other hand, did not (the proof is in the pudding). Engineering is also carried out with marked precision. The drums even sound like drums (that’s saying something for a rock album). The piano is very real, with good resonance on “Proud to Be an American,” the group’s Bicentennial tune. Also of special note is the fine sound of the 12-string guitar on the title cut.

For the true audiophile who likes good, solid, imaginative rock ‘n’ roll,

this album is a must. With this album, The Tubes have proven that they’re more than a show—they’re a band of concerned musicians capable of holding their own in today’s progressive music field. And, if they keep playing like this, they may wind up Young and Rich. C.F.-K.



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AL DI MEOLA: *Land of the Midnight Sun*. [Al Di Meola, producer; Dave Palmer and Frank D'Augusta, engineers; recorded at Electric Lady Recording Studios, New York, N.Y.] Columbia PC 34074.

Performance: **Quite enthralling**
Recording: **Exceeds expectations**

Land of the Midnight Sun is Al Di Meola's first solo effort. For those of you not familiar with Di Meola, he is the guitarist in Chick Corea's *Return To Forever*. Al went the distance in his first endeavor, writing three of the six numbers, producing himself and, of course, playing the style of guitar that has brought this 20-year-old to national prominence. Invariably aided by the members of RTF, Di Meola succeeds in using the solo concept as a logical extension of his work with RTF to showcase his budding talent, rather than just repeating his previous ideas.

Two annoyances on the album are Al's decision to play a Bach Sarabande *à la* Coryell, and to sing. In the first instance, while it is commendable to explore different areas of music and to demonstrate versatility, it has up to now, thanks to Coryell and Di Meola, been used as a gimmick. Neither have the technique to capture the inner voicings of classical pieces. In the second instance, Al has, at best, an average voice. Both of these instances tend to disturb the flow of the album.

Nevertheless, *Midnight Sun* serves as an excellent starting point, a base from which Di Meola can grow as a writer, musician and producer. G.P.

JOE PASS: *Joe Pass at the Montreux Jazz Festival 1975*. [Norman Granz, producer; recorded "live" at the Montreux Jazz Festival, July 17 and 18, 1975.] Pablo 2310-752.



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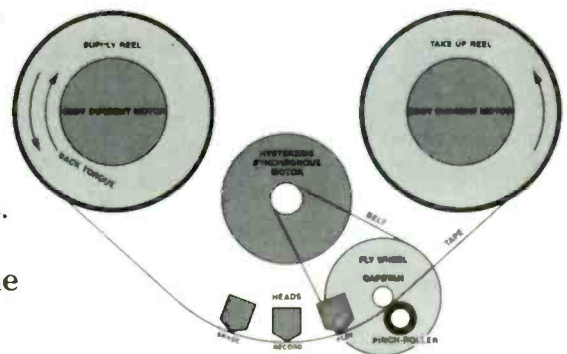
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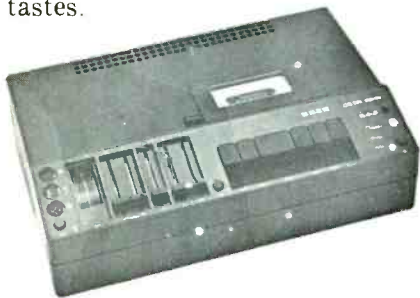
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Performance: **Faultless.**

Recording: **"Live"**

No one has mastered the guitar, both technically and emotionally, as has Joe Pass. It is these qualities which have made him the standard to whom all up-and-coming guitarists are compared. Pass is presently at his peak, as can be evidenced in his two unaccompanied solo releases of the past two years. He not only leaves all other guitarists behind, but also outshines his own trio/quartet work, for in these two albums we hear the electric jazz guitar performed as one approaches the classical guitar—that is, the guitar as an orchestra.

Producer Granz wisely steps aside, allowing Pass the space to stretch out and play to his potential. It is due to that decision that both albums are creatively successful, and will be revered as classics. Pass's simultaneous use of solo melodic and chordal accompaniment lines, with his favorite accents of slur and octave, demonstrate the possibilities of the instrument as no one else has in this medium.

In contrast to *Virtuoso*, his first unaccompanied solo LP, *Montreux* is not as technically energetic, due in part to the fact that most of the tunes are either ballads or approached in that style and, I believe, because his hour-long set followed that of Oscar Peterson. Some of the highlights of this performance include Stevie Wonder's "Sunshine of My Life," Django Reinhardt's classic "Nuages," an original, "Grete" (where he uses the amp's reverb unit for percussive accent—a first!) and closes with "Willow Weep for Me."

The exciting aspect of each Pablo release featuring Pass is that they offer the different moods of the man and his style, whether he's the featured soloist or just playing the accompaniment. The future of jazz guitar is wherever Joe Pass wants to take it.

G.P.

Khamtul Dongyu Nyima VIII, director. [Recorded by David Lewiston; mastering by Robert C. Ludwig (Masterdisk Corp.).] Nonesuch H-72071.

Performance: **Authentic**

Recording: **Awesome!**

This is an astounding recording. The sense of vast space conveyed is nothing less than spectacular, with wall-of-sound ritual chanting that might well constitute nirvana for Phil Spector.

David Lewiston made this recording—just as with several other albums in Nonesuch's Explorer Series—with two mics and a portable Stellavox. It's a good bet that all the mics, channels, consoles, reverb units, limiters, expanders and dial-diddling in the world couldn't produce a more effective, atmospheric recording.

Side one begins with over seven minutes of hypnotic chanting, and for a fleeting moment one suspects that the turntable is on the wrong speed. But then handbells and drums steal into the meditative texture, followed by large drums and horns. The second band introduces still other instruments, and it is here that the recording's huge dynamic range becomes apparent, with the large drums evoking massive, Buddha-like footsteps and the horns bellowing like some primeval dragon.

Robert C. Ludwig's mastering has accommodated over 25 minutes per side without a trace of distortion or pre- or post-echo, and surfaces were mostly fine. The level of tape hiss may be higher than we are accustomed to in these days of Dolby, but it's not annoying.

This disc is a "must" for all sound-fanciers. S.C.

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HERRMANN: Taxi Driver. Bernard Herrmann and Dave Blume cond. [Neely Plumb, producer; Kevin Cleary, Mickey Crofford, Don Henderson; engineers.] Arista AL 4079.

Performance: **Hypnotic**

Recording: **Superb**

The soundtrack for the motion picture *Taxi Driver* is the final work of

Distinctive (If Non-Modern) Sounds

By Nat Hentoff

Respectfully cognizant though I am of the title of this journal, there are times when distinctly *non-modern* recordings require attention. Schnabel's, for obvious example. Or those of La Niña de Los Peines. In such instances, while ardently wishing that the sound quality were of a much higher order, the knowledgeable listener will nonetheless more than settle for nonpareil interpretation. And so it is in jazz. Life-long exegetes of the works of Charlie Parker, for instance, have paid sizeable sums for posthumously released "live" recordings of Bird made on equipment that seems to have been lifted out of Thomas Edison's repair bin. Yet these Parker enthusiasts are happy to have their pinched treasures, just as I will collect anything by Duke Ellington that is remotely audible.

The above having served as prologue, there is much to welcome in *Lester Willis Young, Pres/The Complete Savoy Recordings*. This two-pocket set, while released on a regenerated Savoy label, is actually part of Arista's largely exemplary jazz series—from judiciously selected reissues to such acutely contemporary jazz as that of Cecil Taylor. Arista has bought the musically rich, cheaply made Savoy catalogue and while it seems to have tried mightily to vivify the sound of these particular 1944-49 sessions, it has only slightly succeeded. Nonetheless, only the first side—the big band tracks—is chronically irritating sonically. Fortunately it is the least interesting of the four sides. On the rest (all small combo), while the rhythm sections lack presence much of the time, Lester Young, up front, is more than clear enough for this to be a quite accessible collection for those younger listeners to jazz for whom "Pres" is a sort of honored but remote myth.

There is no space here for an examination of the extraordinary, however subtle, force Lester Young was in the shaping of jazz (see J. R. Taylor's excellent notes). But apart from history (as if that were ever possi-

ble), what made Pres and his music so strangely, softly exhilarating was its fusion of irredeemable loneliness; a kind of wild inner saintliness; and a lyrically antic, mordant and yet terribly gentle comic spirit that only barely hid the basic, defiant romantic—the latter being why Lester was so lonely to begin with.

Another collection of rescued Savoy jazz is *The Changing Face of Harlem/The Savoy Sessions*. Also a two-LP set, recorded in 1944-45, this is an essential historical anthology—again, particularly for those who have come to jazz only within the past decade or so. On these tracks, it is possible to get a sense (sometimes all too briefly) of such key, but largely forgotten, pre-bop players as Frankie Newton, Pete Brown, Emmett Berry, and "Horsecollar" Williams. Furthermore, in addition to three hugely authoritative tracks by Ben Webster, the set has one whole side of Hot Lips Page—a trumpeter, mellophonist and singer who, all in himself, was practically the distilled definition of hot jazz. There should be a complete variorum edition of the recorded works of Lips Page, but at least we now have these performances again. And the sound, as throughout the collection, is better than bearable (the 1970's engineers having done well here). But even if it were no more than bearable, a good many of these performances are, in any case, indispensable.

LESTER YOUNG: *Pres/The Complete Savoy Recordings*. [Buck Ram, Teddy Reig, original producers; Bob Porter, reissue producer; transfers and editing, Jerry Valburn and Jack Towers; mastering, Al Brown, Frankford-Wayne, New York]. SAVOY SJL-2202.

PETE BROWN, "HOT LIPS" PAGE, BEN WEBSTER, etc.: *The Changing Face of Harlem/The Savoy Sessions*. [Buck Ram, original producer; Bob Porter, reissue producer; transfers and editing, Jerry Valburn and Jack Towers; mastering, Al Brown, Frankford-Wayne, New York]. SAVOY SJL-2208.

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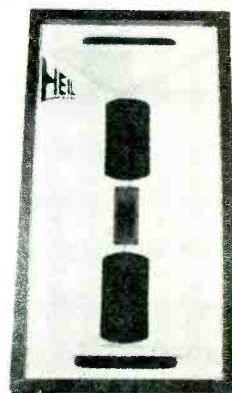
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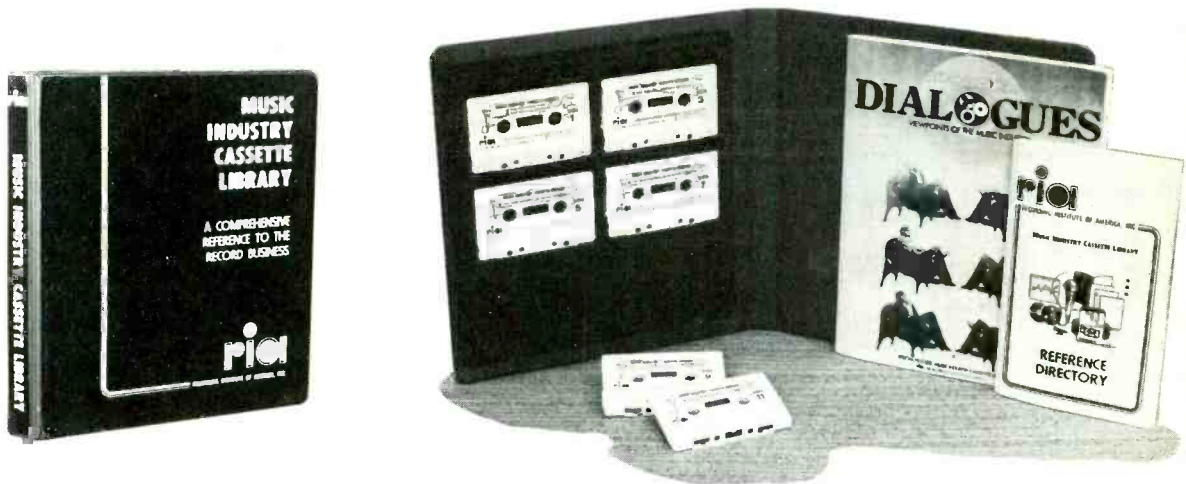
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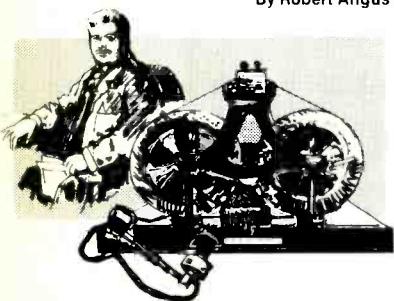
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the composer Bernard Herrmann. Many people don't take film music seriously as music unless it's written by a Copland or Prokofiev. Admittedly, much of what has been called film music is little more than background noise. Bernard Herrmann, however, is a distinct exception to this. While most film composers spewed out a product with the assembly-line sameness of a sausage factory, Herrmann's music has always been highly individual—often strikingly original and usually of high quality. Consistently, since his first film score for *Citizen Kane* in 1941, Herrmann has shown the ability to adapt his unique sound to all styles and periods.

Taxi Driver is the final glorious evidence of this. An atmospheric, subjective film with a delirious, dreamlike rhythm—much of its impact is the direct result of Herrmann's haunting, bizarre score. Utilizing mainly winds, brass and drums plus a synthesizer, this score brilliantly conveys the seamy side of New York life—its repulsive yet hypnotic fascination. Superbly recorded and balanced, highlighted by Tom Scott's marvelous alto sax, this music seems to skirt jazz, soul and disco all at once. It really sounds like nothing you've heard before. And you don't have to see the movie to appreciate it. H.R.

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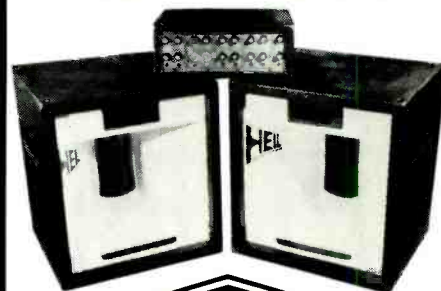
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pletely avoids the obsessive drive that some versions fall into in the final movement of the Eighth. In a word, these performances "glow." Repeats are taken in the first and last movements of the First and the first movement Eighth.

The sound is not particularly well defined in the bass regions, but one accepts that in early stereo recordings. Let us hope that London will soon be releasing Monteux's excellent Beethoven Second and Fourth symphonies. S.C.

MAHLER: Symphony No. 10 (Adagio); *Kindertotenlieder*. Janet Baker, Mezzo-Soprano; New York Philharmonic, Israel Philharmonic, Leonard Bernstein cond. [John McClure, producer; Hellmuth Kolbe, Bud Graham, Ed Michalski, engineers; recorded at Columbia Records' 30th Street Studio, New York, N.Y. and in Tel Aviv, Israel.] Columbia M 33532.

Performance: **Disappointing**
Recording: **Symphony—okay;**
Song cycle—dim

This disc was disappointing on first hearing, so I put it away for a few months. Sad to say, my initial impression remains.

Bernstein has said that he will never conduct any of the "performing versions" of Mahler's unfinished Tenth Symphony, the most notable of which is the superb realization by British Mahler scholar Deryck Cooke (the full score was recently published by AMP). So, it seems to me, he has attempted to make this single movement self-sufficient by exaggerating Mahler's "a tempo (fliessend)" indication at numbers 9 through 19 (Ratz edition), giving the section a scherzo-like quality unlike the rest of the movement.

But creating three separate episodes destroys the steady, almost Bruckner-like arch of the movement. Indeed, Bernstein's command of the long line seems to have deserted him—some of his distended phrasing and overly expressive disregard of note values yielding some very hesitant forward movement. String textures are especially unclear, but the lack of clarity in the winds is probably due more to the engineering.

The *Kindertotenlieder* sounds like one of those recordings that has been

"in the can" for years, unapproved for technical reasons. The amount of distortion, compression and background noise renders the sound hardly better than a mediocre off-the-air tape. It's too bad, for this seems to be a good performance. Those desiring Janet Baker's singing should go to her 1967 recording on Angel, even though Barbirolli's conducting lacks Bernstein's insight and character. S.C.

SMETANA: *Ma Vlast*; Overture and Dances from *The Bartered Bride*.

Saint Louis Symphony and Orchestra, Walter Susskind cond. [Joanna Nickrenz and Marc J. Aubort, musical supervision; Elite Recordings, engineering; recorded in Powell Symphony Hall, Saint Louis, Mo.] Turnabout QTV-S 34619/20.

Performance: **Generalized**
Recording: **Distant**

SMETANA: Ma Vlast. Czech Philharmonic Orchestra, Karel Ancerl cond. [Dr. Ladislav Sip, musical direction; Frantisek Bruda, sound; Charles Repka, mastering; recorded in Prague.] Vanguard SU 9/10.

Performance: **Warm and affectionate**
Recording: **Spacious**

SMETANA: Ma Vlast. Chicago Symphony Orchestra, Rafael Kubelik cond. [David Hall, producer; Robert Fine, engineering; reissue mastered by Philips Records in Holland; recorded in Orchestra Hall, Chicago, Ill.] Mercury SRI 2-77006.

Performance: **Dramatic**
Recording: **Rechannelled**

Czech composer Bedrich Smetana's symphonic poem "The Moldau" is familiar to anyone who has ever listened to "classical" music. But how many people know that this c. 12-minute depiction of the river Vltava as it flows through the countryside and villages toward Prague is only one of six symphonic poems comprising a cycle entitled *Ma Vlast* (My Country)?

Even more esteemed in his native land than his fellow countryman Dvorak, Smetana is considered the musical personification of the Czech spirit. Only the most belligerent curmudgeon could frown at Smetana's rich, melodic style, his simple nation-

alistic fervor. A good performance of *Ma Vlast* rarely fails to embrace the listener with a hearty optimism and humanity. Thus, it is a pleasure to welcome the appearance of the first quad recording, and re-release of the finest ever stereo and mono recordings—all from Czech-born conductors.

The Turnabout is the only new recording of this trio, and if it were the only complete version available, it would be a cause for rejoicing. The orchestral playing is good, the conducting is reliable, and a further bonus is that the fourth side contains excerpts from Smetana's opera *The Bartered Bride*. But comparison with other versions reveals that Susskind's middle-of-the-road approach ignores many dramatic contrasts and occasionally lacks breadth. The distant miking yields rather diffuse textures, which may help to explain the lack of profile in the conducting. Still, this is the only quad version, and it may be recommended without major qualifications.

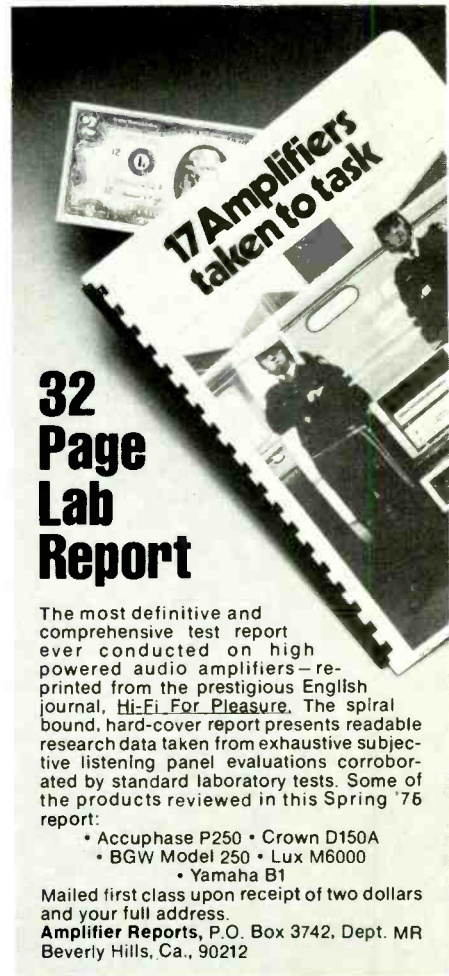
The Vanguard release is part of the American company's liaison with the Czech Supraphon label, and one highly anticipates the number of excellent recordings that should soon receive wider American distribution. The Ancerl/Czech Philharmonic *Ma Vlast* is one of those treasurable recordings which should never be out of the catalogue, and the new Vanguard remastering provides better sound than the two previous incarnations I have heard.

This 1963 recording was formerly available here on Epic's defunct

Crossroads label, where the sound was somewhat lacking in tone—hardly a good representation of the magnificent Czech Philharmonic. Supraphon reissued a lavish repackaging in Europe three years ago, and the sound was cut much higher, but with attendant distortion in loud violin passages. The level of the Vanguard remastering strikes a happy medium: there is a good, solid bass line and the violins don't screech like they do on the Supraphon and to a lesser extent on Crossroads. We are fortunate to have Ancerl's glorious performance available in a good transfer at last.

There is no lack of drama in Kubelik's exciting 1952 recording—his first and best of three. The original Mercury mono discs, recorded with only one Telefunken condenser mic, were startlingly realistic and clean. Therefore, in light of our good fortune to have it available once again, I must sadly report that the Philips mastering of Mercury's domestically rechanneled tape has virtually rendered the sound devoid of presence. The level is lower, and treble and bass are severely attenuated. The sound is much more veiled (especially on side 3), lacking the occasional distortion of Mercury's famous highs, but in the process forfeiting the extraordinary realism and sense of space. Similarly, the gutsy cellos and basses have become a pale reflection of their former selves. Yet, this is the only way to get Kubelik's undeniably superb performance, and it *should* be in every Smetana-lover's collection.

S.C.

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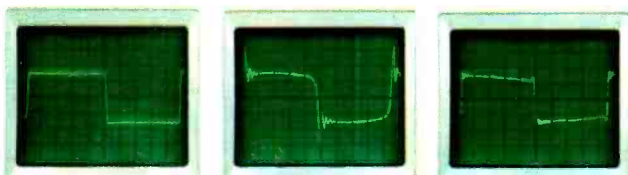
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