SERVING THE CREATIVE AUDIO AND MUSIC ELECTRONICS INDUSTRY

SOUND ARTS

MERCHANDISING JOURNAL

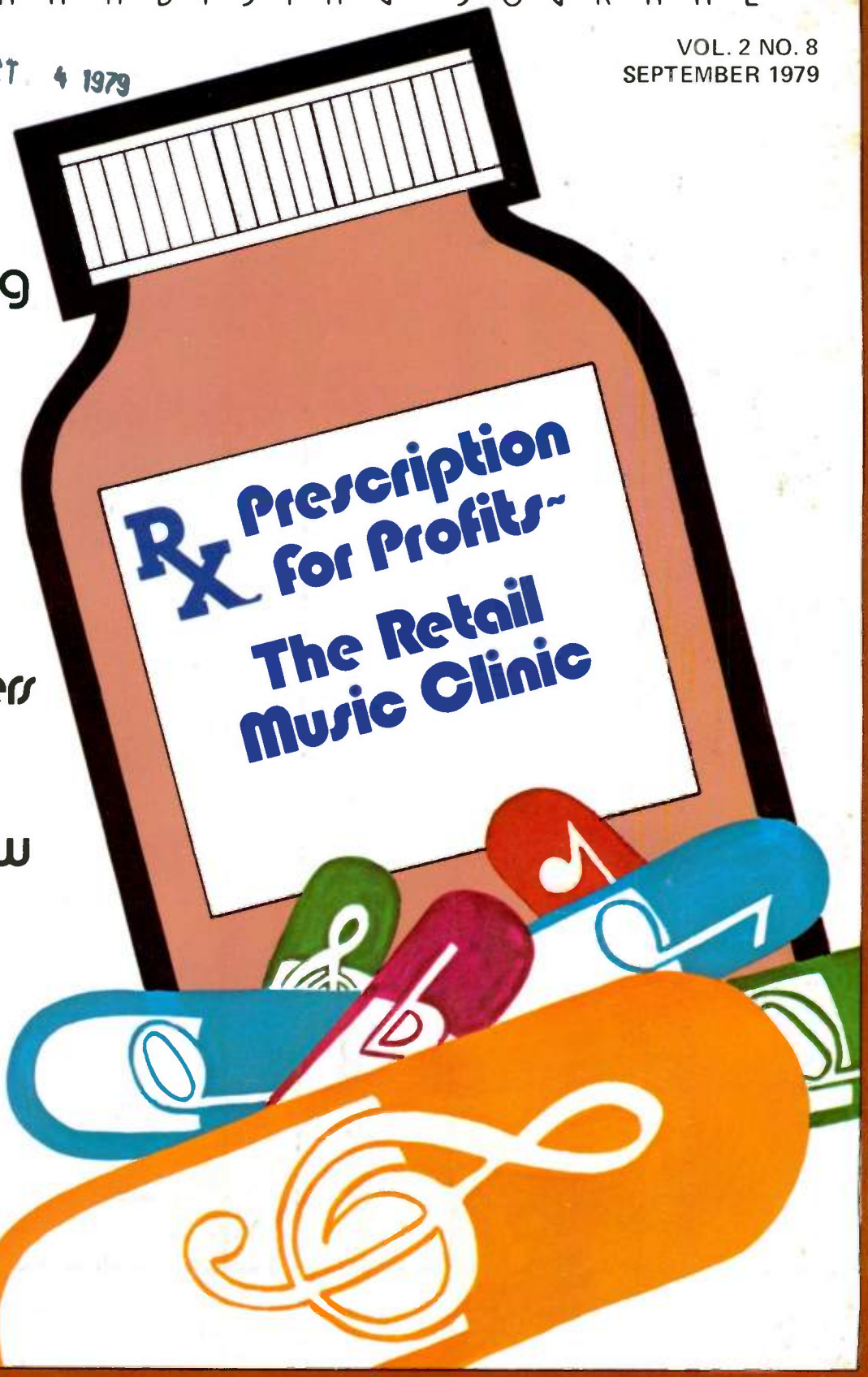
VOL. 2 NO. 8
SEPTEMBER 1979

The Roots Of Recording ~A Talk With Les Paul

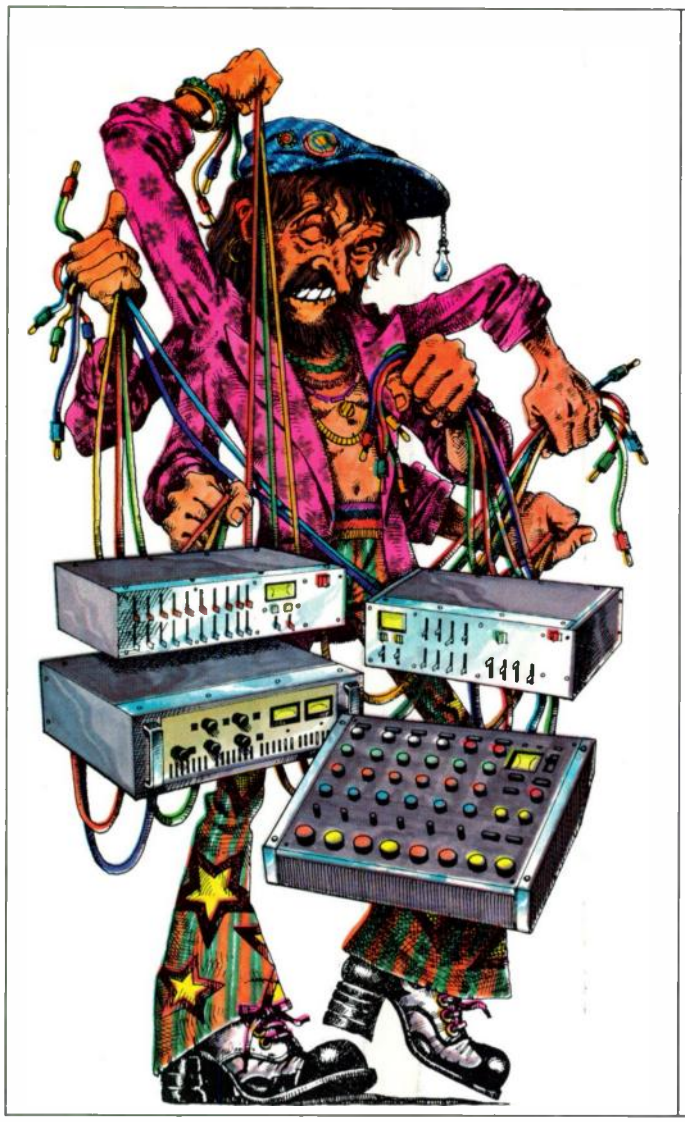
Impedance Ratings Of ...speakers

...verview ...sco ...m VI

Rx Prescription for Profits~ The Retail Music Clinic



THE LONG AND THE SHORT OF SOUND REINFORCEMENT.



You know about the long part. Separate components can keep your hands full, what with the extra help and time needed to get your sound reinforcement act together.

Now for the short part. The Yamaha EM-200 and EM-300 stereo output integrated mixers. They leave you free to concentrate on the creativity of your job, not the mechanics of it.

You get the mixer, power amplifier, 9-band graphic equalizer, echo and reverb control **all in one unit**—great flexibility with options to expand and enlarge.

The EM-200 and EM-300 are ideal for small to medium size reinforcement applications, wherever you need a precisely placed, superbly clean and well-defined sound from a compact source that is easy to set up and operate.

The EM-200 has eight input channels and 120-watt speaker output. The EM-300 has 12 input channels and 200-watt speaker output. For increased flexibility, both the EM-200 and EM-300 have hi and lo impedance monitor output levels (+4dB into 10K ohms, and 0dB into 600 ohms). Additionally, eight patch points allow you to connect accessories directly to the mixer's power amp for dramatically lower noise levels.

The EM-200 and EM-300 give you the short-cut to reinforcement that won't short-change the quality of your sound. They're convenient to set up, operate and locate...at your Yamaha dealer now.

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ROAD TOUGH? PROVE IT.

It's six long feet to the floor. What will happen when our great sound hits bottom? How long will it still sound great? We had to find out. So we picked an ATM41 Dynamic and an ATM91 Fixed-Charge Condenser out of stock, tested them, and started in.

Each was dropped seven times on its side from six feet onto the office floor. Nothing much was happening. So we repeated the series, this time dropping each microphone on its nose. Seven times from six feet. Still no problems. They looked good and sounded good, but *we* were getting tired.

So we moved to an unyeilding slate floor. Here it took three more drops on its side from six feet, and three more on its nose from four feet to finally affect the ATM41. A truly remarkable record!

But what about our ATM91 Fixed-Charge Condenser? It should have given up long before a dynamic. But quite the contrary! The ATM91 withstood four side drops onto slate from six feet, three drops right on the nose from four feet, and another six drops on the nose from *six* feet and still tested OK for sound! Granted it looked anything but new, but it *still performed*

Our little test left us arm-weary but convinced that the ATM Series microphones could easily earn their "Road Tough" name in the field. That's the testing which really counts. Try us.

Part of the secret of ATM toughness is this 3-layer windscreen. An outer heavy wire, a finer wire screen just inside, and an inner layer of woven bronze. All soldered to each other and to a solid brass ring. There's nothing else like it on any microphone.

This ATM91 survived 27 drops from as high as 6 feet!

audio-technica

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Listen to the Electro-Voice story. Your customers are.

As a dealer, you should be interested in the Electro-Voice story, because whether you are selling to the music market, the high fidelity market, the commercial market or the professional market, Electro-Voice is the leader.

The music that your customers listen to at home was probably recorded using Electro-Voice professional microphones and mixed using E-V Sentry® studio monitors. Is it any wonder that E-V Interface® high fidelity speaker systems are rated among the finest for home systems?

If music is your business, it's good to know that the famous EVM loudspeakers are not only standard in many manufacturers' "premier" lines of enclosures, but are the replacement speakers of choice by many concert sound men. These same speakers are standard in *every* Electro-Voice music speaker product. And E-V microphones are seen being used by more vocalists and instrumentalists on stage than ever before.

Commercial Sound? Think of installations like the Pontiac Silverdome, Yankee Stadium and the Las Vegas Convention Center. They're all Electro-Voice. No wonder so many contractors turn to Electro-Voice sound systems for their church, gymnasium and office building contract-sound installations.

If your business is selling sound, Electro-Voice has a story to tell! A story your customers will want to hear. A story that will make a lot of profitable sales for you. To hear the Electro-Voice sales story in person, contact Dave Rothfeld, General Sales Manager, Electro-Voice, Inc., 600 Cecil Street, Buchanan, MI 49107. Phone 616/695-6831.

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CIRCLE 90 ON READER SERVICE CARD

VOL. 2 NO. 8

SERVING THE CREATIVE AUDIO AND MUSIC ELECTRONICS INDUSTRY

SOUND ARTS

MERCHANDISING JOURNAL

SEPT. 1979

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Hints on Equalizing
Tackling Lighting Design

Cover art by Liz Ryan

Sound Arts Merchandising Journal (USPS 410-410) is published monthly by Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, N.Y. 11050. Controlled circulation postage paid at Hanover, New Hampshire 03755. Subscription rates for other than qualified individuals or companies: $18.00 for 12 issues; $26.00 for 24 issues. Add $7.00 per year for subscriptions outside of U.S. Subscriptions must be paid in American currency. Postmaster: Send Form 3579 to Sound Arts Merchandising Journal, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

SERVING THE CREATIVE AUDIO AND MUSIC ELECTRONICS INDUSTRY
SOUND ARTS
MERCHANDISING JOURNAL

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Editorial contributions should be addressed to The Editor, Sound Arts, 14 Vanderventer Ave., Port Washington, N.Y. 11050. Unsolicited manuscripts will be treated with care and must be accompanied by return postage.

A LETTER FROM THE EDITOR

The ubiquitousness of disco has sparked some related philosophical discussions in the nooks and crannies of the industry. To my mind, disco means dancing and dancing itself flourishes in times recession, so hard times don't necessarily affect disco equipment if it is marketed carefully. The word disco itself may reincarnate in another form, but the change in sensibility won't.

Light, sound and physical movement make for a sensory experience that will last in the sense that any major new entertainment format shifts the collective senses and affects the emotions. It seems to me that anyone in the business of marketing semi-professional equipment has to at least consider the possibility of marketing disco equipment.

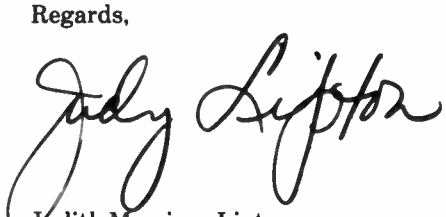
A major interior design award has been won by a home designer for his fully equipped "disco den." Once an entertainment medium reaches that kind of societal acceptability, attention must be paid. A sound installer of my acquaintance tells me that his city is a "rock and roll town. Ted Nugent doesn't make it in a disco." That, I am sure is true—for his city and at this time. Other retailers have found otherwise, have found in fact that disco equipment mixes right in with other forms of semi-professional gear; and that the end user needs a place to buy it—a place with the musical and technical expertise unavailable to him otherwise. If disco doesn't delight your toes, it may however massage your profit margin.

In the spirit of exploring new sensibilities and the possibilities of new product for retail sales, we are presenting in this issue an overview of Disco Forum VI which took place in New York in July. We have concentrated here on the audio end of it, since many of you may not have made it to the show and presumably have your major interests in sound rather light, not to mention glitter T-shirts. Next month we will be running an article on lighting, continuing our exploration of the possibilities of retailing for the senses.

Change in sensibilities is also explored in another article this month—a Talk with Les Paul. Those of us who can remember the first bursting on the scene of the early Les Paul and Mary Ford records remember the perplexing experience of hearing vocals which we couldn't approximate with our voices. This wasn't doo-wah and it wasn't croon. We couldn't do it without electronics and this fact has now become the state of the art.

Teaching consumers how to make this music has become part of the retailer's job. And clinics are an appropriate way to approach that task. The new sensibility which we all quickly took for granted is one which can also be used to increase the attraction of a store. In How to Run a Retail Clinic, Allen Hester presents a task by task account of bringing the clinician (or musician) in to show your customers how it's all done.

Regards,



Judith Morrison Lipton

In the real world of 1% speaker efficiency, 10% sounds unreal.

Most speakers are less than 1% efficient. To compensate for this inefficiency and meet today's sound levels, you need an arsenal of power amps. Because every time you want to increase sound pressure 3 dB, you have to double your power.

Until now.

Fender introduces Concert Speaker Enclosures, the 2-15 R and 1-15 HLR. Each is virtually 10% efficient.

Efficiency, Part I: Theory. If it takes 1,000 watts to achieve a desired sound pressure level through a speaker with 1% efficiency, it takes only 100 watts to achieve that level through a speaker with 10% efficiency.

So the more efficient the speaker, the less power and fewer amps you need.

Efficiency, Part II: Performance. The Fender 2-15 R delivers a sound pressure level of 107 dB at 1 watt/1 meter (pink noise) and handles 400 watts RMS continuous. The 1-15 HLR delivers 105 dB at 1 watt/1 meter (pink noise) and handles 200 watts RMS continuous. That's near 10% efficiency!

Both feature EV15L computer-optimized woofers with edge-wound aluminum voice coils that minimize heat failure. Flush-mounted compression horn/drivers that yield flat response without equalization.

Internal ground lift switches to keep power amps from grounding when the unit is biamped (which, incidentally, lets you separate horn and bass functions). Structural grade aluminum diaphragms that prevent fatigue. And sophisticated crossover using a maximally flat response 18 dB/octave filter.

Thiele-aligned cabinetry. Most important, both Fender cabinets are Thiele-aligned for maximum bandwidth and sound pressure level per cubic foot.

What have you got to lose? Verify the specs and the performance at your authorized Fender dealer.

The only thing you've got to lose is a lot of excess equipment.

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FORUM

Your magazine has been a great asset to those of us who retail consumer and pro audio equipment. I would like to see more articles written on construction projects and have appreciated those that you have had so far.

Would you also send me the back issues I missed, Volume 1, Numbers 1 through 8? Thanks and keep up the good work!

Sincerely,
Wayne Dyrness
Equipment Sales Manager
The DaySpring Recording Studio

We regret that numbers 1 through 8 of Volume 1 are now out of print.

First, I wish to congratulate you for putting out a journal that informs and entertains both the professional retailer and the professional purchaser (me). I really look forward to the day that you will be able to expand your format to include more merchandise reviews and technicalia. The horn article in the April issue ["Homing in on Horns" by L. Richard Feld and Christine Kofoed] was excellent. I have been a loyal supporter of Community products for years and have great faith in their desire to manufacture a superior product. I would like a favor from either you or Christine Kofoed (of Community). I would like you to refer me to a book that will teach me (in a combination of plain English, unbiased facts, and numerous illustrations) the science of how, why, etc. horns and cabinets work. In essence, I would like a book that takes Christine's article on horns further into the realms of sound reproduction. Please send any information you think will help. I am an engineer who knows what he wants, gets it, but wants to know why he gets it.

Claude Baconcini
Ozone Park, NY

***Christine Kofoed replies:** Thank you very much for your positive comments. God knows we try. I don't know of any one book that "tells all," but I've listed a few of the best reference books on sound, sound reproduction, and sound reinforcement. As an engineer you're probably well aware of them:*

Davis, D. & Badmaieff, A., How to Build Loudspeaker Enclosures, Howard Sams & Co., Indianapolis 1975; Davis, D&C., Sound System Engineering, Howard Sams & Co., Indianapolis, 1976; Olson, H.F., Music, Physics & Engineering, Dover Publications, New York, 1966.

Also, most of the information contained in the article, and a great deal more on environment, program material, etc., is included in the Design Considerations section of the Community catalog. Hope it helps.

Thank you very much for my first issue of your terrific magazine. Your article on L.E.D. meters versus mechanical meters is very informative. I appreciate any help I can get to better understand all aspects of being a better sound technician. I would like copies of the back issues of SOUND ARTS. I would like to read all of them and keep them for my files. Keep up the good work. We all appreciate your technical and informative articles.

Sandra M. Johnston
Brandy Musical Partnership
Newport News, VA

I recently read a copy of your magazine. I was impressed with the amount of usable information it contained. Would you please send information on how I can receive your magazine.

John W. Robbins
Robbins Melody Mart
Greensburg, IN

It's done. A request on company letterhead, with your job title included, is enough.

The copies of your magazine that I have read have already been an invaluable help in my product knowledge. I am involved in sales of guitars, sound reinforcement, keyboards (I have attended the Arp intensive synthesizer training course), microphones, amps, etc. I hope I qualify to receive your magazine.

Paul Callicoat
Pied Piper
Huntington, WV

Your subscription has been entered.

We received our first copies of SOUND ARTS today. What can I say? Fantastic! It should be a great asset towards getting our new business heading in the right direction. With people like Craig Anderton and Charlie Lawing, SOUND ARTS has established itself as a quality magazine. I notice that sound people around here either love it or haven't seen it. Keep up the good work!

John J. Brennan
Richard Pepin
Sound Advice
Littleton, MA

We have read the excellent article, Part III, Digital Audio Applications in the June 1979 issue of SOUND ARTS.

The word "Harmonizer" is a valuable trademark of Eventide and has been used as such in advertisements, sales, and in many editorial references in the trade in many countries for a number of years.

I am sure you realize that since it is an important trademark property, we must take all precautions to preserve Eventide's rights therein.

In the article, you use the mark not as a trademark but generically, which is damaging to our trademark rights.

We would appreciate very much your cooperation by a short reference some time soon to the fact that "Harmonizer" is a trademark for an Eventide product.

Very truly yours,
Orville N. Greene
President
Eventide Clockworks, Inc.

The word Harmonizer should have had an upper case H in our article. We regret the omission.—Ed.

TEAR HERE

TERMS:

A CONTINUING INDUSTRY GLOSSARY

RECORDING

By Larry Blakely

Transducer: A device that will convert one form of energy to another. A microphone converts acoustic sound waves into electrical energy. Likewise, a loudspeaker converts electrical energy into acoustical energy. Both loudspeakers and microphones are transducers.

Master Tape Recorder: Usually refers to the two track stereo recorder that is used to record the stereo master tape. The half track tape recording format is the industry standard for such stereo master tape recorders.

Multi-Track Tape Recorder: Refers to tape recorders that utilize two or more channels (tracks). Multi-track tape recorders utilize separate record and playback heads and also incorporate a "sync" mode. The sync mode enables the record head to be used for playback on previously recorded tape tracks. Playing previously recorded tracks and recording new additional tape tracks from the same head (record head) allows all the recorded material on the tape to stay in sync.

Standard Tape Recording Formats: Have to do with the width and corresponding number of tape tracks that exist on a given tape width. It seems that these formats were determined by the number of tape tracks that could be placed on a tape that was ¼" wide. For example, the full-track tape recording format utilized the entire width of a ¼" tape, the half-track tape recording format allowed two tracks to be placed on a ¼" tape width, while the quarter-track tape recording format allows four tracks to be placed on a ¼" tape width. It is important to note that as the track width gets smaller (more tracks on a given width of tape), there is an increase in noise, i.e. the signal-to-noise ratio becomes worse. Tape recorders utilizing the half-track tape recording formats will have better signal-to-noise specifications than a tape recorder utilizing the quarter-track tape recording format, because of the

ELECTRONIC MUSICAL INSTRUMENTS & ACCESSORIES

By Wayne Howe

Audio Frequency Spectrum: The band of frequencies that includes all audible tones (from 20 Hz to 20 kHz.)

Audio Spectrum Analysis: An analysis of the audio frequencies present during a time interval. Spectrum analysis is represented by a graph of frequency vs. volume level. Each frequency is indicated by a vertical line whose height indicates the volume level of that particular frequency. A spectrum analysis of a single tone's harmonic series could be represented by figure 3, where the first line at the left indicates the fundamental, the second line indicates the second harmonic, etc.

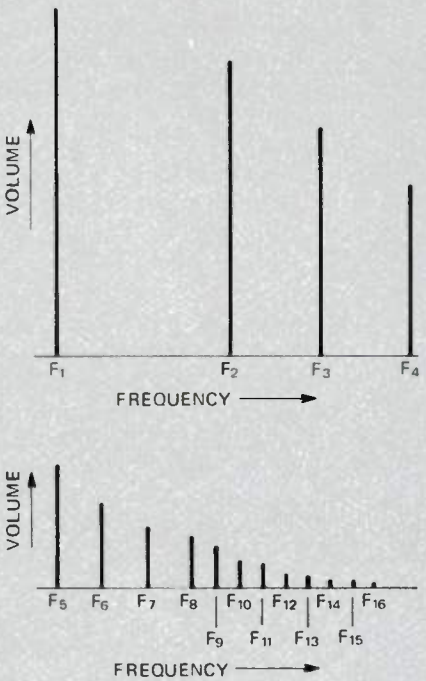


Figure 3

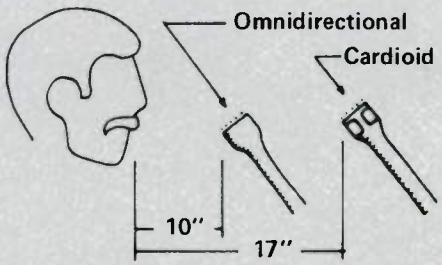
Instrument Output Noise Level: The amount of hum and noise caused by the electronic musical instrument or instrument pickup.

Device Input Noise Level: Hum and noise usually caused in the first stage of the device's circuitry by the residual electronic noise, poor power supply filtering, or RF pickup.

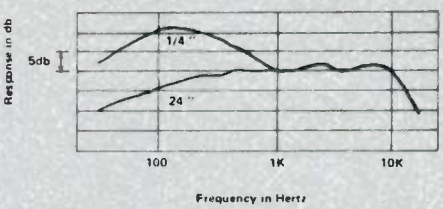
SOUND REINFORCEMENT

By Glen E. Meyer

Advantages of a "Single-D" Cardioid Microphone: 1. When compared to an omnidirectional microphone, it tends to increase the working distance (the distance between the sound source and the microphone) when or if (a) the sound becomes over-reverberant, or (b) the pickup of random background noise becomes excessive, or (c) when system feedback results. This increase in working distance is theoretically more than 1.7 to 1. For instance, if the maximum effective working distance of an omnidirectional microphone is 10 inches, then a cardioid microphone can be used at 17 inches with the same effectiveness.



2. A single-D cardioid microphone emphasizes the bass when used closely. It might make a given performer sound more masculine for effect or it might be used to mike a kick drum to get more of a thump sound if desired. The close-up bass emphasis is known as proximity effect. An example curve of this effect is shown below:



As you will note, at one-quarter inch, the bass response is boosted *15 dB* over the response of the same microphone used at 24 inches and beyond.

Advantages of an Omnidirectional Microphone: 1. An omnidirectional microphone is significantly less suscepti-

TERMS (CONTINUED)

A CONTINUING INDUSTRY GLOSSARY

RECORDING

narrower width of the tape track.

Half-Track Tape Recording Format: A professional tape recording format in which all tracks are recorded in the same direction. Wider tape widths allow more tracks to be placed on the tape. The width of the tape track remains the same; as the tape width increases so do the number of tracks. The number of tape tracks for a given tape are as follows: two track on tape ¼" wide; four tracks on tape ½" wide; eight tracks on tape 1" wide; sixteen tracks on tape 2" wide.

Quarter-Track Tape Recording Format: A professional tape recording format in which all tracks are recorded in the same direction. Wider tape widths allow more tracks to be placed on the tape. The width of the tape track remains the same; as the tape width increases so do the number of tracks. The number of tape tracks for a given tape width are as follows: four tracks on tape ¼" wide; eight tracks on tape ½" wide; sixteen tracks on tape 1" wide.

Two-Track Tape Recorder: Usually refers to the stereo master tape recorder. This machine normally utilizes the half-track recording format.

Four-Track Tape Recorder: Refers to a multitrack tape recorder that has four tracks. Four-track recorders can utilize the half-track or the quarter-track tape recording formats.

Eight Track Tape Recorder: Refers to a multitrack tape recorder that has eight tracks. Eight-track recorders can utilize either the half-track or the quarter-track tape recording format.

Sixteen Track Tape Recorder: Refers to a multi-track tape recorder that has sixteen tracks. Sixteen-track recorders can utilize either the half-track or the quarter-track tape recording format.

Track: A path that is recorded on magnetic tape which contains one channel of information. The width of a tape track will normally be a standard size that will comply with either the half-track or quarter-track standards.

ELECTRONIC MUSICAL INSTRUMENTS & ACCESSORIES

Gain Factor, Sustain Sensitivity, or Compression Range: The amount of gain or boost in a sustain device. The maximum boost that the device can give a weak incoming signal to try to maintain the output waveform at the same overall volume level.

Non-Distorting Sustain Device: A device which sustains using a compression circuit or varying gain device and does not attempt to overdrive the waveform into distortion or clipping.

Fuzz-Sustain: A slightly different effect from a level-sensing amplifier (which boosts the output waveform inversely from the input waveform). A fuzz-sustain can be caused by overdriving an amplifier stage into clipping so that the output voltage of the amp remains fairly constant. As the input signal decreases, the output waveform remains at the same level and becomes cleaner (less distorted and clipped) until the input waveform is below the clipping level. At this point, the output waveform is non-distorted and follows the same level changes as the input waveform.

The advantage of this type of device is that the output waveform does not become noisier as the sustain is held. The disadvantage of this device is that you cannot get a "clean" sustain; you can only get a distorted sustain. On this device the length of sustain affects the amount of distortion and vice versa.

Distortion and Sustain Device: This type of device uses both of the previous types of devices. The advantage of this is that you can vary the amount of distortion and sustain totally independently of one another.

Limiter: A device similar to a compressor which turns down the volume of input waveforms only above a certain level. Soft notes played below this level are passed without alteration. Whereas a compressor would turn the level of loud notes down and the level of soft notes up, a limiter would only turn the loud notes down.

SOUND REINFORCEMENT

ble to breath or P-pops than a cardioid. 2. For a given price, an omnidirectional microphone generally has a smoother frequency response than its cardioid counterpart. 3. The omni mike has the same frequency response at all working distances from the microphone. It does not have proximity effect, which changes the sound and may mask the very upper frequencies which help impart intelligibility. 4. It has basically the same frequency response on axis as it does off axis. 5. An omnidirectional microphone is significantly less sensitive to mechanical shock and handling noise than its cardioid counterpart. 6. The omnidirectional microphone is generally more rugged than a cardioid.

Line Microphone: A highly directional microphone; the output originating from the source at the side of the microphone is reduced nearly as much as if the sound source were at the rear. Such microphones are also known as shotgun (due to their appearance) or interference tube microphones. They are constructed by attaching a specially designed slotted tube on the front of an omnidirectional or cardioid microphone. If the sound originates on axis, the sound pressure is unimpeded by the tube and the microphone works as though the tube were not there. When the sound is at 90 degrees off axis, however, the sound wave enters the entire length of the tube at essentially the same instant. As these waves become trapped in the tube and start their travel down the length, toward the generating element, they encounter new arriving waves which happen to be out of phase. The result is that the waves cancel each other out. Depending on the line microphone, they lose much of their directionality capabilities below 400 Hz or so.

Line microphones are best suited for news-gathering, motion picture, and broadcast studio recording. Unfortunately, they generally are not suitable for sound reinforcement work.

Today's hottest recording group.

Latest sales figures show that Maxell is the fastest-growing brand of recording tape in the country today.

It's not surprising.

Maxell cassettes are used by more people who own the finest tape equipment than any other brand.

Our open-reel and eight-track tapes have been accumulating some great performance records of their own.

Call your Maxell representative for an audition.

You'll find he, like our tape, is really worth listening to.

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TROUBLESHOOTERS' BULLETIN

Troubleshooters' Bulletin is designed as an aid to the dealer. Input is invited from both manufacturers and retailers. Share the wealth of your knowledge. Items refer to repair of equipment, preventive maintenance, and the correction of customer misconceptions. Send your contributions to SOUND ARTS MERCHANDISING JOURNAL, 14 Vanderventer Avenue, Port Washington, New York 11050.

AZIMUTH ADJUSTMENT

It is most important to adjust record and playback heads for correct gap azimuth. However, heads which are badly worn or grooved should be replaced. This means that the gap line should be exactly perpendicular to the edge of the tape. Otherwise, a loss in high-frequency response will occur, depending upon the degree of mis-azimuth error. The wider the track, the more

critical the azimuth adjustment.

All head mountings, with the exception of special precision ground fixed mounts, include an azimuth adjustment feature. The adjustment screw rocks the head back and forth to bring the gap into vertical alignment with the information recorded on the tape.

The best way to adjust for azimuth is to play the high frequency azimuth tone of

an alignment test tape and turn the screw until maximum output is obtained from the playback head.

Record head azimuth should be adjusted next while recording a high frequency and monitoring it with the previously adjusted play head.

J. D. STRAND
NORTRONICS

STAGE MONITORS

Once the customer is satisfied that he is getting the absolute most from his floor monitors, if he still needs more on-stage sound, advise him to use a two-way system with electronic crossovers. Set this system right behind the front PA stacks, aimed back at the band. Using radial horns and high efficiency bass bins allows the side monitors to be turned up quite loud before feedback, as they can

be 50 feet away from the microphones, and still give terrific volume on-stage.

It should be noted that the mix console must have a separate monitor mix on each channel with no connection to the house mix, so that the monitor mix can be set and not changed by any adjustment to the house.

BOB HEIL
HEIL SOUND

WHEN THE HIGHS MISS HALF THE AUDIENCE

Let's say a system uses only a 12-inch cone speaker mounted in a box. At low frequencies, sound is dispersed over a very wide angle (in fact, almost omni-directional). This is because the cone is small in comparison to the wavelength of low frequencies. Wavelength is velocity of sound in air (1130 feet per second) divided by the frequency. So, for example, the wavelength at 50 Hz is 22.6 feet. That

is quite a bit larger than a 12-inch speaker. As you go up in frequency, the 12-inch speaker becomes larger than the wavelength and a phenomenon called beaming starts to occur. This is where, instead of having very wide dispersion or coverage angle, you have increasingly narrow coverage. This is why the listeners at the side of the room sometimes can't hear the high frequencies. The sound is dull and unintelligible. Therefore, coverage angle (dispersion) over the range

of frequencies involved is an important consideration in speaker system design.

A speaker's dispersion of sound as the listener moves to various angles off the speaker axis is typically shown in a polar response graph. Measurements are usually made in both the horizontal and vertical planes.

A typical approach is to feed the

speaker a test signal containing all of the frequencies in an octave, like 2400 to 4800 Hz. This avoids the confusing variations of single-frequency measurements. Since the test signal contains all the frequencies in the octave of interest, it has no definable pitch or musicality, but instead sounds something like the between-station noise on an FM receiver. Therefore, the signal is called "random

noise." The loudness (SPL) of this noise is measured at all points around the speaker, at a constant distance away, and the level is recorded on the polar graph. Remember, a 10 dB difference in SPL is perceived as "twice as loud." So, with some frequencies "half as loud," some "nearly as loud," and some nearly gone, it is little wonder that people at the side of the room can hear poor, muddy sound.

Uniform dispersion is one of the most important and neglected characteristics of a speaker system. Using separate components designed for operation over their portion of the audio spectrum instead of using just one speaker will generally yield superior overall performance where the application calls for reproducing the full frequency range.

Knowing something about the dispersion angle can help you select speakers for your

application. Speakers should be directed to cover the listeners. Viewing the listening area from a desired speaker location, determine what dispersion angle would be needed to adequately cover the listeners without spilling over to the walls in both the horizontal and vertical planes. Once these angles are determined, the correct speaker can be found by consulting engineering data sheets and catalogs.

JEFF WHITE
ELECTRO-VOICE

What are pink and white noise and for what are they used?

Both pink and white noise are noise signals that contain *all* of the audio frequencies that human beings can hear—nominally everything between 20 Hz and 20,000 Hz. Unlike ordinary single tones, however, white and pink noise deliver all of these frequencies in a purely random nature. That is, while all the audio frequencies are present in the signals, their amplitudes and occurence are entirely random, as is the duration of any given frequency. If you were to listen to white or pink noise by connecting such a signal source to an amplifier and speaker, you would hear something that very much resembles the random "static" you hear when you tune between stations on an FM set.

As to the *difference* between white and pink noise, it is largely a matter of the amplitude relationships of all the frequencies contained in the signal. In the case of white noise, all frequencies (from 20 Hz to 20 kHz) are represented in equal voltage amplitude. Pink noise, on the other hand, is really white noise that has been modified so that with increasing frequency, the amplitude diminished at the rate of 3 dB per octave. Thus, the amplitude of any 2 kHz component in pink noise will be 3 dB lower (on average) than the amplitude of a 1 kHz signal contained in the same pink noise signal. This is done so that the average *energy* (sound power) will be the same over any frequency increment, such as an octave, or a third-octave. Since audio frequencies are plotted (and heard) on a logarithmic (rather than linear) scale, higher frequencies are "bunched" together more than lower frequencies, so it takes less amplitude of each individual frequency in a higher-frequency portion of the spectrum to equal the energy in a lower frequency segment.

The usefulness of pink noise arises from its very randomness; no single frequency stays on for very long, though its long-term presence is predictable. In trying to measure the frequency response of an audio system in a listening room, if we were to use regular, pure tones, some of these tones would be at the natural resonant frequencies of the room-size, or at some multiple or sub-multiple of room resonances. Single tones might therefore be reinforced (or, at some points in the room, cancelled) because of room resonances which give rise to "standing waves." This would lead to highly erroneous measurement results.

By using "pink noise" for such acoustic measurements, these problems are overcome, since no single frequency stays around long enough for the listening room to "build up" reinforced resonant levels of energy. Frequencies come and go, as we said, in a random nature, but because the *average* energy content of pink noise is known to be equal for all frequency segments, an accurate response measurement of the system can be made.

In using pink noise to make response measurements, the noise is reproduced by the system under test, over its loudspeakers. A calibrated microphone picks up the sounds which are fed to a real-time audio analyzer. This device consists of octave, or third-octave filters which read the multiple of only a small group of frequencies. This amplitude is then displayed on a scope or by means of LED displays—one display per filter. By seeing the *overall* response of the system in this way, devoid of any false resonance, a graphic equalizer can then be used to establish flat response (or any other desired response curve) for the system.

Len Feldman
Feldman Electronic Laboratories
Great Neck, NY

How can I be sure that my microphone isn't causing system overload? What does that mean? How can I prevent it?

Simply, it's not your microphone itself that "overloads." It's probably some other part of the system, most likely the preamplifier portion of your mixer. But let's start at the beginning.

Microphones, or more precisely, transducers, charge acoustical energy (sound waves are air pressure variations) into electrical energy (voltage). Any modern, well-designed transducer element should be able to accept sound pressure levels in excess of 150 dB (that's the signal one hundred times stronger than the auditory threshold of pain for humans), without itself buckling under the pressure and showing signs of significant overload and/or distortion. So at 150 dB SPL most transducer elements will be supplying considerable voltage (!!) to whatever follows in the signal chain. If the next stage of the system can't take the level the transducer puts out, that stage will be overloaded.

For the dynamic and ribbon-type microphones, the transducer portion of the mic is usually fed directly to the preamplifier (mixer) or through an impedance-matching transformer first. For condenser-type transducers, add an impedance buffer and/or a pre-preamplifier to the chain. Most transformers can stand the high levels and pass it on through, but it is the electronics that are the limiting factors in system overload.

Since all condenser microphones have two parts—transducer and electronics—you must choose them carefully when miking loud or loud transient-producing sound sources (percussion instruments, closely-miked brass instruments, etc.), as the electronics portion, or preamplifier, could easily distort. Most have internal attenuator switches to help control this. With mixers, look for models that offer overload indicators, usually LED's, and input attenuator controls on each channel. If not, you can buy or build your own level attenuators, or pads, and insert them in line between the mic and the preamplifier.

Paul Bugielski
Product Manager—Microphones and Circuitry Products
Shure Bros., Inc.
Evanston, IL

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Analog Sequencers

By Craig Anderton

One of the most popular synthesizer modules is the *sequencer*; it is also one that has undergone very dramatic changes during the 70s. These changes have accelerated with the advent of inexpensive computer and memory technology.

In order to understand the newer, digital sequencers (which can be intimidating to the uninitiated), it is important to look at the analog sequencer and how it evolved. At each stage of its development, certain problems cropped up—problems which were generally solved during subsequent generations of sequencer designs.

IN THE BEGINNING

We've already discussed the power of voltage control—how we can use programmed voltages to create extremely complex sonic changes, all in real time, with a minimum amount of manual dexterity required of the performer. We've seen how a keyboard generates control voltages, which, when fed to an oscillator, produce specific sets of pitches. Then again, we have envelope generators that produce a predictably changing control voltage that is useful for controlling voltage controlled filters and voltage controlled amplifiers. The sequencer is yet another control voltage generator that generates a series, or *sequence*, of control voltages.

Early sequencers were designed around analog technology, but the introduction of digital circuitry has not (yet) made the analog sequencer obsolete . . . although the analog sequencer is far more limited compared to the newer digital types. Due to its straightforwardness, our discussion of sequencers should really begin with the analog type.

CONTROLS AND OUTPUTS

A basic eight-stage sequencer produces a repeating series of eight control voltages in sequence (see Figure 1). Each knob dials in a particular control voltage; this control voltage appears at the control voltage (CV) output jack. With the start/stop switch toggled to *start*, the sequence begins by having the voltage selected by knob 1 appear at the CV out jack. After a period of time (set by the rate control), the voltage selected by knob 2 appears at the CV out jack. Next the voltage selected by knob 3 appears at the CV output, and so on until finally the voltage selected by knob 8 appears at the output. At this point, unless the start/stop switch is in the *stop* position, the sequence of control voltages will start all over again from stage 1.

With the rate (or speed) control set for a slow speed, the transition from one step to the next of the sequencer is rather slow. Turning this control clockwise increases the tempo of the sequence.

What do we do with the CV out? We can feed it to an oscillator, and produce a series of 8 repeating notes. Or, we can feed it to a filter, and change the resonant frequency in a sequenced pattern . . . actually, any voltage controlled module may be controlled by the sequencer.

IMPROVEMENTS TO THE BASIC SEQUENCER

It didn't take long for musicians to start asking for more, and engineers to start re-designing in response. One improvement is to increase the number of stages in the sequence—say, from 8 to 16. This allows the musician to create sequences that are twice as long as the eight-step sequences we've examined so far. An additional improvement is some kind of indicator light to let you know which stage of the sequence is "on" at any given moment.

Another problem we need to consider occurs when feeding a sequence of control voltages to an oscillator. When the oscillator is controlled via keyboard, the keyboard sends out trigger pulses for timing purposes, as discussed in earlier parts of this series. Our sequencer as presented thus far has no such capability. So, we add a trigger out jack along with the CV out jack so that we get a trigger pulse out every time the sequencer changes from one stage to the next. Or, we could put a trigger pulse output in for *each* stage so that when different stages "fire," they can trigger different events. A compromise between having a single trigger output jack and a trigger output for each stage is to have a switch for each stage that selects whether a trigger pulse will come out of a single trigger output jack when a particular stage "fires."

Another limitation of your simple

sequencer is that, as we said, it puts out eight sequenced voltages and then repeats. This is fine for compositions based on a 4/4 type of time signature, but what if you want a repeating figure that repeats, say, every five or seven steps? The answer is to have a *reset* option for each stage; if you select the reset option on, for example, the fifth stage, then the sequence will skip from the fifth stage back to the beginning of the sequence again, ignoring stages 6-8.

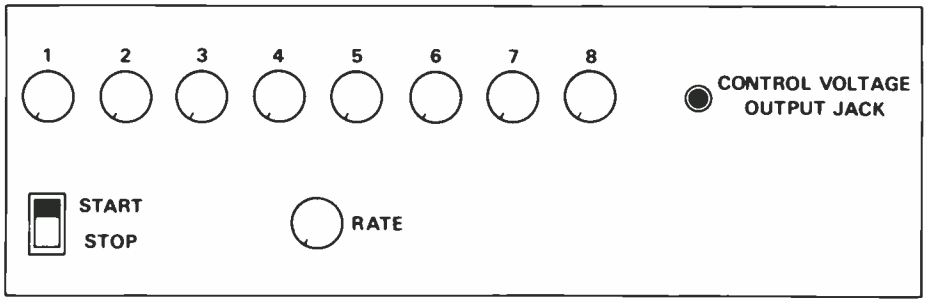

Figure 1

MULTIPLE SEQUENCES

A single sequence repeated over and over again can easily get pretty boring; even a 16 or 32 stage sequence is not really versatile enough to be very useful musically. So, one alternative has been to take a 16 stage sequencer and offer the option to break it up into two individual 8 stage sequencers. Similarly, a 32 stage sequencer could produce two 16 stage sequences, or four 8 stage sequences. Thus, you could set separate sequences for the traditional "verse/chorus" type of song structure, with another sequence or two used for fills or instrumental breaks, and select whichever sequence you needed at any given moment.

However, every time you add an improvement, you also increase the operating complexity. Having 32 knobs, loads of trigger jacks, reset options, and the like can get pretty overwhelming. Also, the control voltages coming out of the various sequencers have to be rock-stable when you're driving something like an oscillator; analog systems must be very carefully designed in order to attain this desired level of stability. And, attempting to "play" a sequencer can be a very difficult task due to the operating complexity of the device . . . the idea of something such as a 1000 stage analog sequencer, for example, is really too absurd to contemplate (unless your idea of fun is adjusting 1000 knobs!).

Another problem: What happens when you're in the studio, and you lay down a sequenced track . . . then you decide to add another sequenced track as an overdub? Well, it's almost impossible to synchronize the overdub to the original sequence, because even the slightest speed inconsistency in the tape recorder or sequencer clock circuitry will cause the overdubbed sequence to go out of sync with the original. While it is *possible* to sync two tracks together manually, it's such a time-consuming drag that very few, if any, musicians would wish to use this technique as long as any other type of alternative was available.

ENTER THE DIGITAL SEQUENCER

The answer to many, if not all, of the problems mentioned above is the *digital* sequencer. This particular type of sequencer can store so many control voltages (or more precisely, control words), and so much trigger information, that the musician now has what is effectively a small scale computerized composing machine. Some models even allow you to simulate the effect of a tape recorder by "recording" a sequence in real time, and then overdubbing additional sequences—also in real time.

One would think that something this complex would be very difficult to operate; yet, just the reverse is true. However, those unfamiliar with computer concepts might find themselves perplexed by some of the functions associated with digital sequencers. Next month, we'll investigate the digital sequencer in more detail.

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For All Retailers:

RETAIL MUSIC CLINICS

Run one each fiscal period for economic depression.

by Allen Hester

First of all, what is a clinic? As the term applies to music stores, a clinic is understood to be a brief session involving one principal speaker/demonstrator and a relatively small audience. A clinic is different from a seminar or workshop in a couple of ways. Seminars usually have more than one speaker, last several days, and cost a healthy fee for each participant. Likewise workshops, where participants get more hands-on training with a particular instrument.

A clinic, on the other hand, usually lasts no more than a couple of hours and does not involve any individual instruction by the clinician. Instead, the group receives a demonstration of the clinician's proficiency on a particular instrument, accompanied by the clinician's explanation of his technique, his practice routine, and so forth. A question and answer period usually follows each brief period of actual playing by the clinician.

Just as important, a clinic covers *product.* The clinician is acting as a spokesman for a particular product, whether it be drums, guitars, synthesizers or whatever. Some arrangement has been made with the manufacturer of a specific product in which an artist endorses that product in exchange for either cash or equipment from the manufacturer.

In most cases the artist has achieved "star" status in his or her field and is recognized as an authority on how to play music of some kind. Because of that star status (and the accompanying fee!), a clinic usually won't last more than two hours. The attention span of the audience is no longer than two hours and the artist wants too much money to stay all day anyway. So a clinic is a two-hour program featuring one principal speaker.

Now that we have some mutual understanding of what a clinic is, let's talk about reasons for having one.

A clinic should not be used as a "come-on" just to get people in the store. A good clinician will *not* get up and do a hard sell routine on behalf of the product he is using, and store personnel would be wise to stay away from a hard sell approach, too. The purpose of a clinic is simply this: To draw a distinction between a warehouse and a music store.

Warehouse operations are interested in one thing: moving the product out the door. Music stores, on the other hand, must provide services as well as product.

One of the most valuable services that a music store can provide is some form of education. Private lessons, group discussions on such topics as recording techniques or acoustic principles, and clinics are some of the ways that stores can let their customers know that they care.

Therefore, the hard sell should be avoided, and the role of the store as an involved, concerned entity should be emphasized. In the long run, customers will come to identify the store that offers clinics as having a high degree of credibility in the business. People will remember that your salesmen have spent some time with major recording and touring musicians, and customers will be more inclined to believe what your salesmen say.

One other reason, and certainly not the least important one, for getting involved with clinics: *You* will learn something, too! Chances are that the clinician will say something that will open your eyes to new products, new sales approaches, or some good advice that you can pass on to your customers. If you take the attitude that you've "seen 'em all," your clinic is likely to fall flat on its face. If you are going to do it, *you* have to get excited, *genuinely excited* about having a clinician come to your store. Enthusiasm is the prime ingredient.

Now let's talk a little about how to do a clinic.

First of all, decide what area you want to concentrate on: guitar, bass, keyboards or some other instrument. Find out from your customers which artists they are listening to in that particular area and try to pick a clinician that already has somewhat of a following among your customers. Knowing that there is already some interest in that person will help you get excited about the prospect.

After you have a "target" in terms

of a clinician, sit down and put some ideas on paper. Before you approach the clinician, have an outline in front of you. The more specific and organized you can be, the more the companies involved will listen to you.

In order to make the clinic a success, the involvement of several people is essential. The clinician is involved by virtue of being paid a fee to come and do the clinic, so his or her enthusiasm should be no big problem. However, the people you really need to get behind you are: the record company on which the clinician is currently recording; the clinician's personal manager; the area representative of the company that the clinician endorses; and the artist relations department at the company whose product is featured at the clinic.

If all four of these are sufficiently notified and impressed as to your enthusiasm and determination, then the clinic should be a good one. Also, if anything breaks down at the last minute, these people will be able to exercise their influence to help make sure that the clinician meets his obligation. By all means, get in touch with these people and get them on your team.

One thing you should consider when choosing your clinician is how closely the manufacturer of the target product works with the musicians in the field. Some companies have an established tradition in this area, other companies are less experienced at handling celebrities. This can be important not only in terms of cooperation, but also in terms of cost, to be discussed later.

The record company should be able to provide several things which will be of great benefit to the clinic. Press packages are usually available, complete with logos, biographical sketches, and glossy photographs of the celebrity. Record companies will provide free albums for giveaways at the clinic, and in some cases, a stand-up display of the artist or group being featured in the clinic.

Likewise the manufacturer will often have a clinic package (although this differs greatly from company to company) which contains "how-to" tips on presenting a clinic. It is always wise to request that the manufacturer send along as much educational material as is available, as well as any posters which display the product and/or the clinician who is scheduled to appear.

The artist relations department at the manufacturer will be of valuable assistance in familiarizing you with the clinician—it is their job to get to know the artist on a first-name basis. This will aid you in breaking the ice with the artist when he or she arrives to do the clinic.

Call the artist's personal manager and get acquainted. Let them know how much effort is going into the clinic. Usually the artist relations department at the manufacturer will handle this for you, but it is better if you do it yourself.

The next step in organizing a clinic is to begin scheduling the various elements. You *must* schedule everything at least 30 days in advance! Give yourself plenty of time to bring everything together smoothly.

First you must decide whether to have the clinic during business hours in the store, or after hours, either in the store or at some other location. Daytime and nighttime clinics will draw two different crowds. The best thing to do is to mix the times up from clinic to clinic so that everyone has a chance to come to a clinic. There is no way to satisfy everybody with any one particular time because people work at all hours. However, there are a few times that are definitely no good. Friday and Saturday nights simply won't work. Too many musicians will be at work. Weekends are generally bad because of recreational activities, family life and so forth. Monday and Tuesday nights are generally the best nights to schedule, since most clubs are "dark" on those nights. This means that musicians will be free to attend and that the local clubs may be available for hosting the clinic.

If you decide to have the clinic at some location other than your store, it is wise to secure a commitment in writing from the manager of your chosen location. This will prevent any last-minute "backing-out" if the person in charge of your facility gets cold feet (and it has happened!).

The location you choose must go hand in hand with whether or not you intend to charge an admission fee. Public facilities such as schools and colleges will not be able to host the clinic if an admission fee is to be charged, *unless* the proceeds go entirely to a charity. If only a portion of the proceeds go to charity, public facilities will be unavailable.

One more word about charities: if you work in conjunction with a charity there is specific wording that the charity will insist on. This can influence your advertising, and in some areas limit the scope of your promotional effort. Care should be taken in choosing a charity.

There are several ways to defer the cost of bringing in a clinician without charging admission. If you work in conjunction with a school, the school will often be willing to split the cost of the clinic. One other good way is to sell T-shirts, especially if the clinician is a "hot property" with albums in the record charts. A good T-shirt design can pay for the entire clinic, but you have to take a chance on it.

Often times a radio station will be interested in "co-opping" the clinic, especially if their format includes music by the clinician. However, a radio station will want to offer you free radio spots instead of cash. This can work out very well, though, when you put it in the proper perspective; that is, a strong local station will draw plenty of people to the clinic who will in turn purchase T-shirts and so forth, thereby helping to pay the cost of the clinic itself.

If you choose not to involve a radio station in a co-op, it is still a good idea to book some radio time for advertising. It is best to begin running your spots about ten days in advance of the clinic. Keep in mind that the best time to reach young people is in the late afternoon, evenings and weekends, which is also some of the cheapest radio time you can buy. If you depend solely on Public Service Annoucements, you won't get very much response from radio. Radio stations are required by law to air PSA's but they are placed in a rotating file with no priority given to any one announcement. Moreover, if you are charging an admission fee, you cannot get a PSA on the radio (unless the entire proceeds are going to charity).

The same basic idea applies to print advertising. Any PSA in the newspaper is likely to be printed in the smallest type possible and buried in a large list of such announcements in some obscure section of the paper. If you prepare print advertising, it is best to place it either in the sports or entertainment section of the paper. Use a simple "line-art" drawing that can be reduced or enlarged to fit in any newspaper format.

Advertising planning is one of the primary reasons for scheduling everything at least 30 days in advance. Another primary reason is this: One sure way to generate interest in the

clinic is to display the instrument that the clinician is going to play at the clinic in a prominent place in your store. We all know how things can get bogged down in shipping, so be sure to allow yourself enough time to get the instrument on display at least ten days in advance. Make a large display sign so that everybody can see what is going to happen when the clinician arrives to demonstrate that instrument. Immediately, that instrument takes on a special aura apart from the other items in the store; more than likely it will be sold within a week after the clinic to a customer who was particularly impressed with the clinician.

Beyond radio and newspaper advertising, there are a couple of other effective ways to promote the clinic. A "quick-print" flyer can be used variously as a display poster in the store; a mailer that can be sent to customers on your mailing list; and as a bulletin that can be placed in schools, nightclubs and record stores on bulletin boards. Another thing is a printed invitation, usually post-card size, that can be mailed or passed out by hand. Personal invitations are very effective, especially when you take the time to sign them by hand. Also, if you intend to charge an admission fee, tickets will have to be printed. All of these promotional tools take time to prepare, so don't try to work with less than 30 days advance preparation.

Assuming now that all the advance preparations have been made, the big day finally arrives. It is best to go the airport and pick up the clinician personally. You should have enough background info on the clinician (supplied by the record company and the artist relations department at the manufacturer) to engage the clinician in a good conversation.

Once you have become acquainted, ask the clinician how he or she intends to approach the clinic. You should already know how experienced the artist is at doing a clinic. In some cases the artist will have no prior experience. If this is the case, it is up to you to offer suggestions as to how the clinic should be conducted. At this point, if you have done your homework, there should be no problem. One way to be sure you are prepared to offer helpful suggestions is to keep a list of your customers' questions on file. Compile this list in the time before the clinic. By doing so, you will know what to suggest to the inexperienced clinician. The main thing you must convey to the clinician is your enthusiasm and positive attitude!

When the clinic actually gets underway, your role becomes very critical. If the clinician is inexperienced, some prompting questions may be in order. Be careful, though, not to dominate the conversation with your own queries. It is not at all unethical, and probably a good idea, to have some "plants" in the audience. These people can be members of your staff or regular customers who have been instructed to ask specific questions of the clinician. This is important for two reasons: good questions loosen up the clinician; and the people in the audience will lose their reluctance to address a celebrity for fear of sounding "dumb." Regular folks are always a little bit awed by a celebrity and tend to withhold a good question rather than risk being embarrassed. Once a few questions have been asked, everybody relaxes and the clinic gets off to a good start.

If you have the necessary equipment it is always a good idea to record the clinic for future reference. Videotapes make the greatest sales tools, but of course not every store will be able to do them. By all means, at least turn the tape recorder on during the clinic. Keep a camera on hand, but avoid using a flash if you can, because it distracts the clinician.

Have someone posted at the door to make sure that everyone signs a guest list. Get names, addresses and phone numbers so that you can do a thorough follow-up after the clinic is over. Have someone help you count the house, and keep a record of attendance at each clinic that you do.

When the clinic is over, make sure that you gather up all the signs, posters, bulletins, promo material, extra T-shirts, rolls of film, etc. Don't let anything get away, because you will want all the "leftovers" to file.

The file will be useful in at least two ways. When you get ready to do the next clinic, you can refer back to your file for tips on what you did wrong and what you did right. Future clinicians will be impressed if you can present them with evidence of past successful clinics. Also, the necessary follow-up procedure will be better if you can send along a reminder of the clinic to your customers.

The guest register is a very important thing to have for the post-clinic procedure. You will want to send each person who attended the clinic a post-card to express your thanks for their participation. Go ahead and take the time to sign the follow-up postcards by hand—this will lend a personal touch to your "thank-you" notes.

Pictures and tapes of the clinic become very important after the clinic. Pictures should be displayed either in a scrapbook or on a wall display that is specifically set aside for your clinic memorabilia. Also, you will want to have prints made of the pictures so that you can send copies to the record company, the manufacturer, and all other co-sponsors and parties that were involved.

The benefits of the clinic, or perhaps I should say the merits of the clinic, have already been discussed. The idea is to distinguish your store as a place where professional musicians come and offer their expertise to your customers. In addition, if you do a clinic up right, the clinician will take your name back out on the road and spread the good word about your store, which can't possibly hurt you either.

Beyond the benefits (although they are admittedly long-term benefits rather than immediate sales in most cases) that a successful clinic brings, there is a great deal of personal satisfaction to be found in organizing a good clinic. Selling musical merchandise is a more personal service than selling cars or vacuum cleaners or anything else. Music is a universal language that can be shared and appreciated by everyone, whether one actually plays or not. Bringing an accomplished musician into close contact with other musicians and music lovers is a very important thing because it often exposes a side of the musician that the recordings and the concerts do not reveal. By relating to the audience how he practices, how he exercises, how he diets and how he perceives his own role in music, a clinician reveals his humanness. All the pomp and circumstance of the concert stage is set aside, and the audience sees the musician for what he really is—a dedicated, striving professional.

Authors Note: Special thanks to Dave Patrick of Strings and Things in Memphis for his valuable insights. "Big Dave" has hosted such great drummers as Roy Burns, Jack DeJohnette, Tommy Aldridge, Carmine Appice, Steve Smith and Leigh-Howard Stevern (marimbist) in many successful and revealing clinics done in the "Drum Stand."

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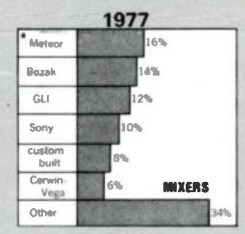

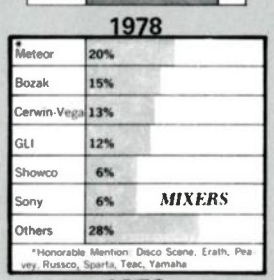

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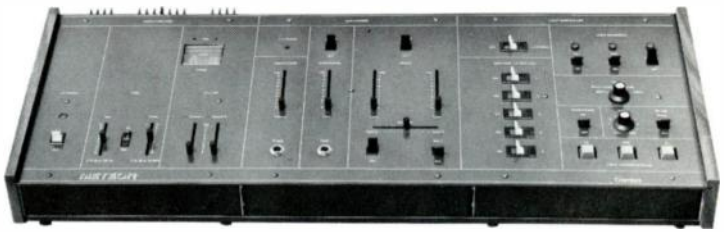

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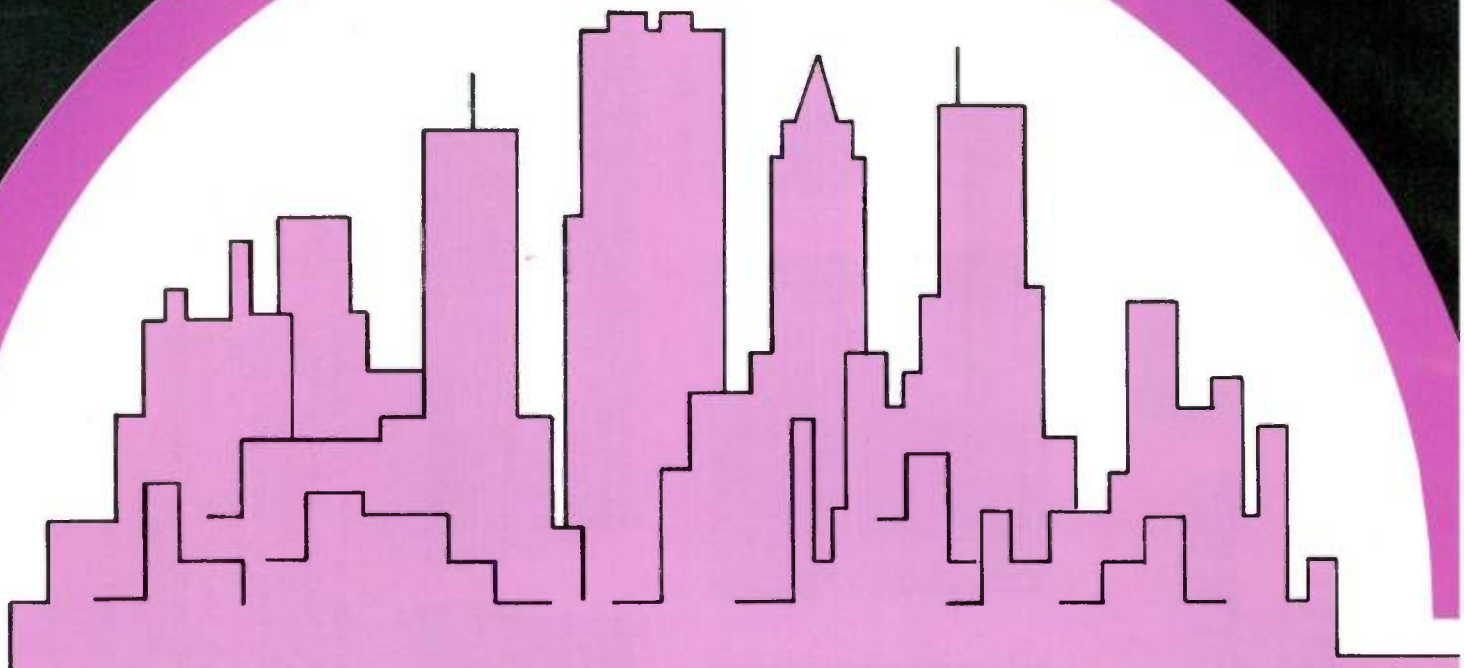


NEW YORK DISCO FORUMS

The four-day long Disco Forum VI convention in July filled the New York Hilton with T-shirts and tights, woofers and tweeters, deejays and records.

Like its predecessors, Disco VI gathered from every corner of the world: club owners, record promoters, lighting and audio manufacturers, fashion designers, club designers, audio installers and retailers. Unlike its predecessors, Disco VI painted, I think, a picture of what many might expect from disco in the years to come. Earlier this year, a good number of exhibitors at Disco V were there to "feel out" the market. This time, however, the tune was different. Many exhibitors at Disco VI now saw disco as their "bread and butter."

To give you some idea of disco statistics, in the July 10, 1978 issue of *Forbes*, disco revenues were put at five billion dollars. *The Detroit Free Press* of October 8, 1978 reported that the number of discos in the United States rose from 10,000 to 18,000 in the past year. The December 14, 1978 issue of the *New York Post* reported that 40 to 45 million Americans have gone to a disco at least once; 17 to 19 million go regularly.

Despite what these media might say, there are still those who have doubts about the impact and the longevity of disco. For them, Disco VI would have seemed like the final moments on the Titanic. For others though, it was an opportunity to meet fellow tradesmen and display new product concepts.

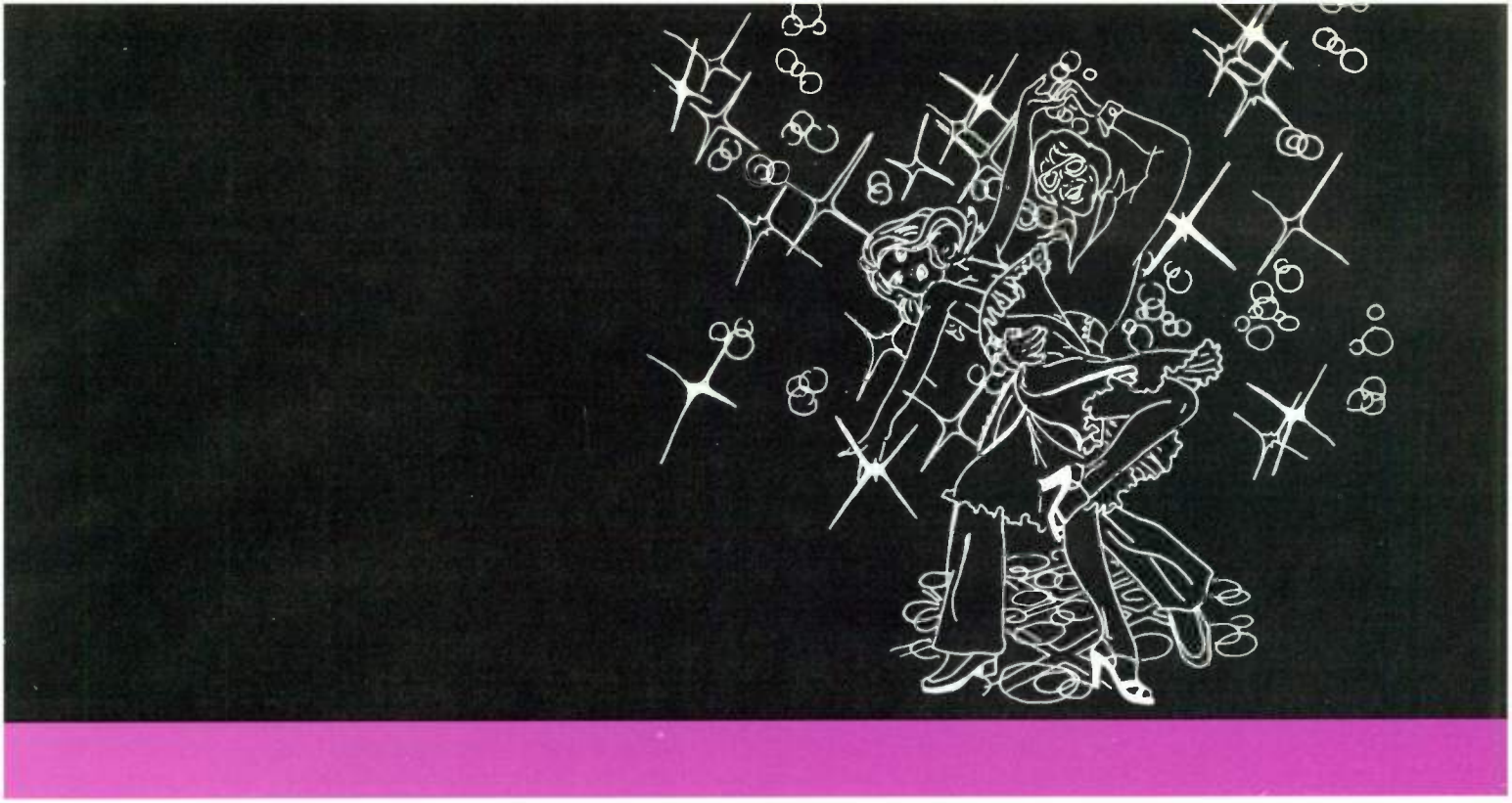
The main exhibit floor offered a wide assortment of products and services for the disco market—everything from frozen daiquiris to hot disco dancewear. Most of the exhibits on this floor were of a non-audio nature, primarily because manufacturers were unable to demonstrate their audio products in the open display area.

From the diversity and broad scope of the exhibits presented, it was clear that disco had expanded as a market. Whole companies are springing up with products and services devoted exclusively to disco. Some manufacturers traveled from as far away as France to attend the Forum; among these was Comel, a manufacturer of mixers, amps, speakers and equalizers designed for professional disco applications. Comel's product line, Paris Power, exhibited progressive design and engineering. It was clear that the French take disco very seriously. Among the products displayed was their PMP 402B disco mixer.

Though music is really the heart of the disco industry, fashion is also making its presence felt. Disco dancewear and jewelry are now becoming hot sellers. One exhibitor, Esia, specialized in "fantasy fashions" for entertainers, roller disco and disco nightlife. Eye-catching too were the electronic flashing disco shirts, lighted arm bands and head bands from Hollywood Flash.

One of the things that Disco VI offered many people was a chance to view disco from a comprehensive perspective. For example, many New Yorkers tend to view disco from the perspective of Studio 54. Disco VI helped many to see that the disco chic is not limited to just New York. The size, scope and sophistication of discos in Europe, South America and the West Coast certainly rival that of Studio 54.

One of the prime ingredients at Disco VI was the music—the fifth floor exhibits were rocking with it. Audio exhibitors included, among others,



AN OVERVIEW

By Henry Collins

BGW, Cerwin-Vega, Community Light and Sound, Inc., dbx, GLI, JBL, Rosner Custom Sound, Stanton Magnetics, Technics, Richard Long & Associates, and Altec Lansing—a mixture of the traditional audio and pro sound companies who have moved into the disco market and the seasoned disco pros.

Richard Long & Associates displayed their latest design—Ultima, a tri-amplified full-range speaker. When asked what he sees for the future of disco, Long commented, "The industry is definitely expanding and the technology is growing. People are a lot more quality conscious and are willing to pay for it."

Alex Rosner of Rosner Custom Sound, another proponent of professional sound, commented, "The demand for high quality disco sound is increasing at a surprising rate. The public is far more conscious of quality."

Paul Friedman of GLI noted that this Disco Forum saw a lot more buyers from large hotels and restaurant establishments and fewer get-rich-quick types.

The demand for product excellence and system design is a critical part of the disco industry. As the market has become more aware of the products and product requirements for this industry, individuals and companies emerged as recognized authorities on professional disco sound. In fact, it wasn't until recently that many audio manufacturers finally began to take disco seriously. If the current trend continues, the buying habits of the general public will, I think, take a tremendous turn towards disco. The old promise of "two cars in every garage" will be replaced by "two turntables in every living room." At this Disco Forum, dbx introduced the Model 504, a stereo version of the 503; the 501, a single-band stereo dynamic range expander; and the 505, a combination stereo expander subharmonic synthesizer.

Among the newly arrived Disco Forum exhibitors, JBL showed a new disco subwoofer and BGW exhibited their power amps. Community Sound, returning to the show after a long hiatus, showed their PBL-90, which was also shown at the AES convention. GLI, a Disco Forum veteran, and BGW both looked for reactions to their new equipment ideas—a full range cabinet and an electronic crossover respectively. Cerwin Vega showed a new bass cabinet.

Opinions from exhibitors on the success of the show ranged from mildly favorable to negative, with the main complaints, predictably, concerning the closeness of this show in time and geographical area to the previous show, the low number of serious buying attendees, and the difficulty of showing new products every six months. Some exhibitors found a marked increase in foreign buyers, others found a decrease. Retailers seconded these observations. These comments, though negative, are comments not on disco itself, but on this particular disco forum. Disco as an industry provoked mainly positive views. This was not a buying show, report exhibitors; but valuable contacts were made for a lot of people.

In addition to the product displays and exhibits which dominated most of Disco VI, there were also a number of panel discussions. Many attended the panels with the hope of discussing some of the problems facing disco entrepreneurs. Some gathered with the

idea of starting associations designed to solve some of their basic problems. Panel discussions included: The Role of the Mobile Deejay; Disco Radio; Publishing and Licensing; and Disco Franchising.

Among those products displayed at the forum, one which best described the level of sophistication and fast-growing acceptance of disco was the that of a company called Compu-Club Systems, Inc., which has expanded the use of the computer in disco to include such things as membership and door control, mailing lists, inventory, accounts receivables, payroll, etc.

Some of the comments that came out of the Disco Forum seem to indicate a growing trend in the professional audio industry. For the first time in the history of the audio industry, the spotlight has been focusd on equipment. With promises of earth-shattering bass and amplifier power in the kilowatts, clubowners have been successful in capturing a sizable piece of the disco market. One of the main protagonists behind the discotechnical revolution is Technics. Since the advent of their direct-drive turntable line, particularly their SL-1200, customers for the first time were given a massive dose of professional audio equipment. To this day, Technics is still the watchword in professional-quality turntables. Many manufacturers who have been trying desperately to win the same credibility for their product lines have now turned to disco as the way out.

Disco, even with its ever-increasing popularity, is yet to reach the same level of organization and institutionalization as the hi-fi industry.

Commenting on the ever-increasing growth and sale of disco products to the general consumer, Vincent Finnegan of Meteor Light and Sound has said, "Though much of disco light and sound equipment is purchased primarily by club owners and mobile djs, there are also a considerable number of consumers making use of this equipment in their homes." He went on to say, "I believe that before long, disco will not be restricted to just clubs, but that it will emerge as a form of home entertainment."

Commenting on the disco trend, Wayne Rosso, director of special projects for ACI/Dave Kelsey in Los Angeles had this to say: "Disco has made the consumer bigger prey for more powerful amplifiers and larger speakers. It has made big sellers out of names like Cerwin Vega, BGW and Technics. Disco has simply given the audio salesman another means to put more money in his pocket."

Years ago, the audio industry offered the consumer an entirely new concept in listening enjoyment—four-channel sound. This revolutionary concept would enable the consumer to enjoy the excitement of concert hall sound right in his livingroom. Many audio manufacturers invested millions of dollars in four-channel sound technology in anticipation of overwhelming public acceptance. Well, as we all know, four-channel sound never really made it big. On the other hand, disco, in just a few years, has done much to encourage the sale of time-delay devices for use in four-channel sound systems. Four-channel sound and other related devices seem aptly suited for disco. Disco has been instrumental in popularizing the use of electronic crossovers in multi-amplifier sound systems here in the United States.

Another fine example of disco's influence on the audio consumer has been the increased sale of high powered amplifiers. For years, the audio industry has been telling the consumer about "clipping" and about the difference a high-powered amplifier can make in sound fidelity. Well, consumers didn't need much persuasion to buy high-power amplifiers once they heard them in use at discos. If disco continues to gain increased public acceptance, it's clear that before long, the buying habits of the audio consumer will turn to disco. I would say that in two years, disco will have made a significant impact on the audio industry. The buying trend at that time will go from hi-fi to professional audio equipment. This is made evident by the fact that nearly all the audio manufacturers currently marketing products in the United States have a separate line of professional-quality audio components.

Disco Forum VI, in brief, was a look at the inner workings of the disco industry. As a new industry, it will see a lot of growth and development in the years to come. The word "disco" itself will probably refer to a whole cultural revolution that took place in this country in the "seventies." A revolution that took audio and visual entertainment to the very limits of man's technology. Disco is alive and well. As Gloria Gaynor aptly put it . . . "I will survive."

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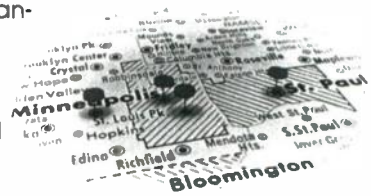

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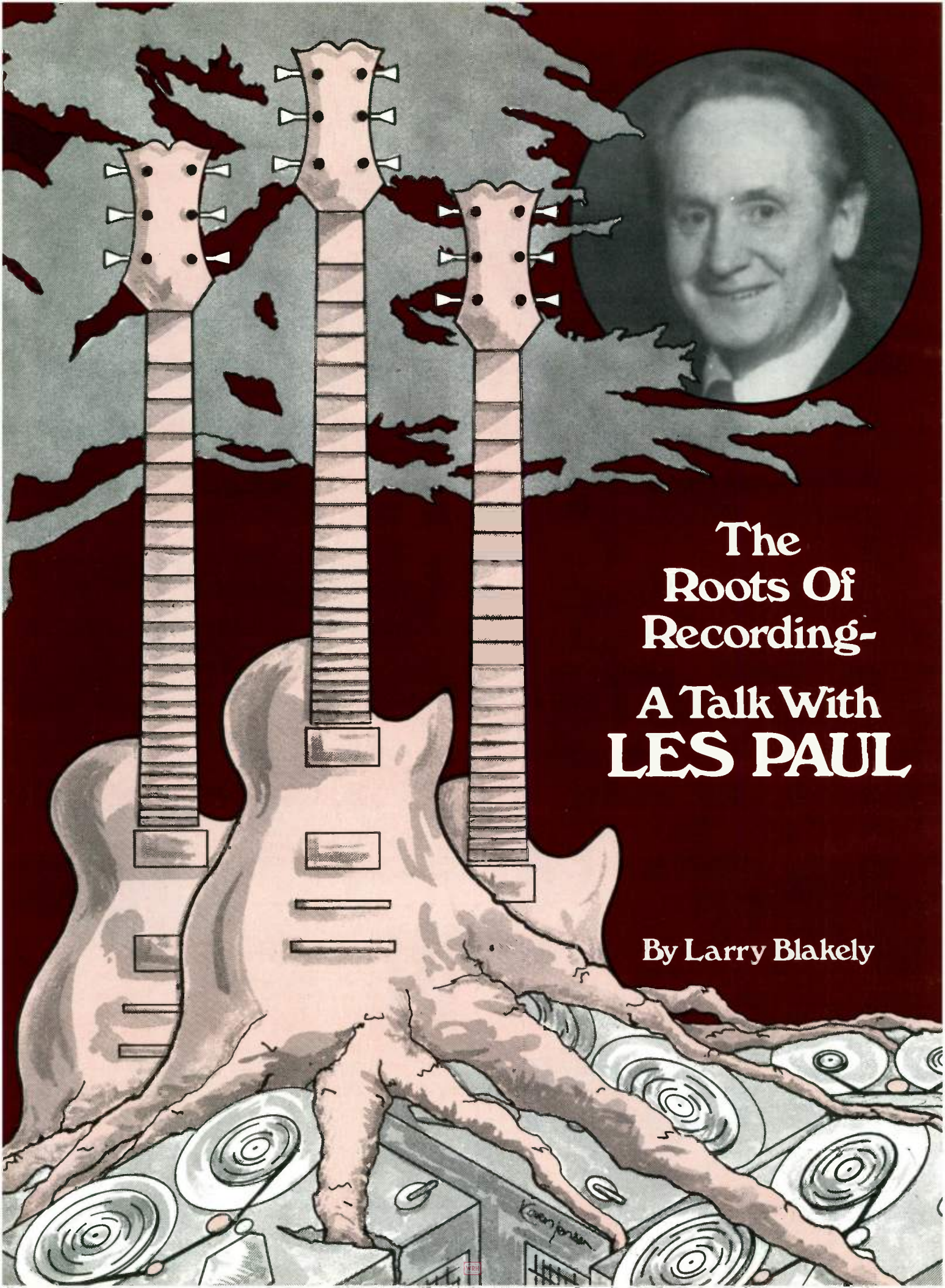

The Roots Of Recording-

A Talk With LES PAUL

By Larry Blakely

We are today deeply engrossed in the exploding field of the creative audio industry. We may all wear different hats; but whatever our task, we all belong to the same home. The tools and types of equipment with which we work every day—mixers, microphones, multitrack tape recorders, compressor/limiters, phasers, flangers, stereo tapes and records, and now even digital audio—are often taken very much for granted.

It may be beneficial to get a sense of our mutual roots by reflecting back to the earlier days of our industry when there was not much technology and what there was was very crude. At the foundation of almost any industry, we find a key pioneer. Such innovators were often the *crazy men* of their time, with new devices and methods that were often referred to as gimmicks.

In my opinion, Les Paul today represents the roots of the creative audio industry. The number of his contributions are often not fully realized by the rest of us. And all of Les Paul's contributions came from the need for a better way, a tradition still carried on.

In talking to Les Paul, one finds the background to the innovations he produced. Les claims that his first idea for a new twist was adding new musical parts to his mother's player piano by punching extra holes in the player piano rolls. (He reports that this did not make his mother very happy.) Les refers to the player piano as a forerunner to digital, since you could slow down or speed up the music without changing the musical pitch.

In the 1920's, when the young Les Paul was playing a Sears and Roebuck guitar, he found that his audience couldn't hear him well. So he stole the electric pick-up from a phonograph and jammed it into the top of his guitar and fed the signal through a wire into his mother's table radio. He then took a single button carbon microphone and fed that signal into his father's battery-operated radio and performed at a theater. Les says that the "tips" were better; his audience could hear him.

When he became interested in recording his music, Paul made a disc recording lathe. Gathering up parts such as a motor and a lead screw from his father, his first attempts at making recording lathes were somewhat crude, but sometime between 1937 and 1938 he had a recording lathe that was working to his satisfaction. Installing the recording lathe behind a pull-down bed in his apartment, he could pull down the bed, gain access to the recording lathe, and start recording.

About 1944, in California Paul decided to build an even better record cutting lathe. For $10 per night he rented a place in a hobby shop to work in at night. The turntable for this recording lathe was made from a Cadillac flywheel, and a motor from a juke box. While the frequency response on the records of the time only went out to about 6,000 or 7,000 Hz, Paul sought out a man who could make him a cutter head that had response to 12,500 Hz. Les now had extended frequency response on the records he was cutting, but he then needed a playback phonograph cartridge that also had extended frequency response. He came across some prototype GE variable reluctance phonograph cartridges (the first magnetic phono cartridges) which he modified and then had an extended frequency response phonograph cartridge.

At this time all recordings were of course monaural, recorded direct to disc, and the sound was usually picked up by one microphone placed some distance from the performers. Striving for a fuller, more present type of recorded sound, Paul built a recording studio in his garage at a cost of some $650. During this time he started using close microphone placement techniques to obtain more presence in his recordings, with separate microphones for each instrument, combining the microphone signals through a microphone mixer. Bing Crosby and others came to him and asked how he was getting that sound and subsequently started recording in Les Paul's garage recording studio. "I wanted better sounding records than the accepted recording methods and equipment of the time would allow, so I built my own studio and became a rebel . . . . I did it because I had to do it," Paul says.

After the studio was built, Les purchased some of Jim Lansing's loudspeakers for monitoring. A long hall became a reverberation chamber, with a microphone at one end and a loudspeaker at the other. He was doing slap back with a cutting lathe that had a playback cartridge following the cutting head. The distance between the two heads could be adjusted to change the timing of the slap back. Phasing and flanging were done with the use of two turntables.

After World War II, people like Colonel Ranger and Jack Mullen brought tape recorders from Germany. Working with the new tape recorders, Les installed extra heads and made sound-on-sound recordings. He devised his own type of manual compressor, by simply watching the needle of a very large VU meter and learning to play in a way that made the needle stand still. Adjusting the pick-ups on his guitars so the different notes would be near the same level, he taught Mary Ford to sing and look at the needle and automatically turn her head on loud notes so as to keep the needle of the VU meter standing still. All of these practices and methods enabled him to make far superior sounding records. But attempts by others at duplicating the sound Les achieved were unsuccessful. As Paul says, "It's not what you have that counts, but knowing what to do with it."

In 1954, Ampex built, at Paul's request, an eight-track multitrack recorder, while Paul himself began building a multitrack recording console with a monitor section and other advanced features. By 1956, the multitrack tape recorder and recording console were in full operation. Even though the recorder was an excellent tool, Les says today that the sound-on-sound recording process was much quicker. His recording of "How High the Moon" was done with sound-on-sound, comprised of 24 recordings stacked on top of each other. Variable speed capability was also added to his multitrack recorder in an effort to do half-speed recording and variations.

The other important side of Les Paul is the Guitar Builder. Using a crude electric guitar at an early age, his quest for better sound was not restricted to recording equipment. He also desired a better and different sound from electric guitars.

In 1934 he asked August Larson in Chicago to build a guitar with a ½" thick solid maple top. This was a semi-hollow body guitar, so that the top of the guitar or pickup wouldn't vibrate or resonate because of the strings and bridge. The semi-hollow body guitar was excellent for jazz and was designed for a mellow sound or what Les calls a "dark sound."

Placing two pickups on a single guitar provided two different types of sounds for selection—or a still different sound by using both pickups together. In 1941 a 4x4 piece of wood carved down, with two wings and two pickups, etc., became the solid body

guitar referred to as "The Log." Paul then took his guitar ideas to Gibson and they kindly showed him the door. Meanwhile, Paul continued to develop his guitar ideas, conceiving a steel bridge and trapeze tail piece, along with different types of electric pick-ups. In 1949, the president of Chicago Musical Instruments (which owned Gibson) said, "Go find that character with the broomstick with pickups on it." An agreement was signed to make a Les Paul guitar—the hollow body guitar with a log down the center to allow the guitar to sustain. Les says today that no changes have been made in it. "It took my whole life to build that guitar. When I built it I didn't make it for anybody else; I built it for myself." Of course the Les Paul solid body guitar is also made by Gibson.

Les Paul has covered a lot of ground in his life, not only by inventing recording methods and equipment and musical instruments, but also as an accomplished musician and performer and recording artist.

I asked Les how he feels about his contributions to the industry. He replied, "I just rode along with it . . . I'm always into new ideas. I see many things that are being done today that I was doing way back when, but when I did them they were called gimmicks."

Speaking about today's music and recording industry and what advice he would have for today's musicians and sound engineers, Les Paul says, "Today's musician knows a lot more about the tools of his craft; he is more knowledgeable about his instrument, as well as sound and recording procedures. He is more aware. Today's musician is curious, he is reading, he is in studios and around sound gear, and what he doesn't know he is finding out. He can go into a music store and find most anything that he likes. Today's musician can see performers on TV and in the movies, he can buy their records and study the techniques of other musicians. With all of these aids he can learn much faster. Musicians today also have a wide variety of instruments as well as effects devices to expand their creativity.

"I ask today's musician to keep in mind, that it's what you do with what you have. You should be a creator, and should know how to be a performer, producer, engineer, and a writer. Above all if you have a crazy idea, throw it out on the table. They will either laugh at it or use it, but don't be afraid to express your ideas."

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IMPEDANCE RATINGS OF LOUDSPEAKERS

By Barry McKinnon

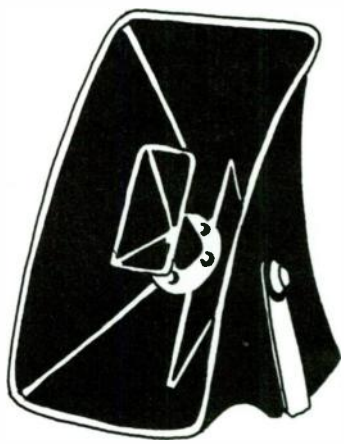
One of the most commonly asked questions when looking at a raw frame speaker for the purpose of buying is, "How many ohms is it?" Most people have the concept down pat of matching the number of ohms printed on the back of the power amplifier. They know that if the numbers don't match something will happen; they might not be sure as to exactly what will happen, but it surely won't be good. Some people even know that if the number on the speaker is lower than the lowest number on the amp, the amp could end up looking like a fourth of July celebration. Professionals who make their living by buying, selling, renting or whatever in the sound business know that it is a good idea to match the numbers in order to prevent their amp, reputation and profits from going down the tubes.

The reason for this little numbers game is two-fold: One, the impedance rating of a speaker will determine the amount of power that is to be delivered to it by a given amplifier. In the case of a direct coupled transistor amplifier it will actually determine the amount of current the amp will deliver; in a transformer coupled amplifier it will determine the optimum current and voltage delivered to the speaker while minimizing distortion and losses. In the case of a solid state amplifier, the maximum current available from the power supply is limited by the size of the power supply. (Look at the B± fuses for this figure.) If you try a speaker with an impedance below the one printed on the back of the amp, it will attempt to deliver more current than it can safely do and either blow fuses, or in the case of tinfoil fuses, output devices. Most transistor amplifiers are very close to constant voltage sources; that is, for a given input voltage (say 1 volt+2 VU approx.) it will give you the amplified voltage output (say 40 volts) no matter what the impedance is. It will only change the amount of current delivered. (Doubling the current doubles the power).

If an amp is supposed to put out 250 watts at 8 ohms, it will be putting out roughly 45 volts at 5.5 amps. If the amp will hold together when you put a 4 ohm load on it and actually put out 500 watts, it will be delivering 11 amps. At 16 ohms it will probably put out about 125 watts and only 2.75 amps. In transformer coupled amplifiers (typical guitar amps, etc.), mismatches in impedance result in poor power transfer. A downward mismatch will draw excessive current from the transformer and consequently the tubes or whatever and cause distortion and a reduced tube life. An upward mismatch will cause a loss in power due to too low a voltage which is needed at the speaker to develop the desired power.

The second reason for proper knowledge of speaker impedance is for the speaker's sake. Take, for example, a popular bass guitar speaker, rated at 150 watts continuous program and a nominal impedance of 8 ohms. Ah ha! The word *nominal* is used in conjunction with impedance. The measured impedance of this speaker (and it's the measured impedance, plotted against frequency, that is of ccncern here) shows that it is typically between five and seven ohms over a large segment of its operating range. What this means is, if one innocently hooked this poor defenseless bass speaker up to a 150 watts per channel direct coupled amplifier, this speaker could be getting up to 250 watts when its owner thought it was getting a nice safe 150. Ah! Now you see, that just might be the reason you had two speakers come apart at the seams when they were presumably operating within their power limits.

The term *nominal impedance* has no hard and fast interpretation either. Nominal to one manufacturer might mean within 10 ohms, and to another it may mean as much as a 40-50 ohm deviation. Yes, that *is* right. A 16 ohm (nominal) bass speaker may have an impedance at some frequencies as high as 100 ohms, and your customer won-



dered why it seemed to sound a bit thin in the bottom end. Shown in figure 1 is the impedance versus frequency plot of three commonly used professional calibre bass speakers. These curves were taken in free air without an enclosure. You will note that an enclosure will change these characteristics; it won't make them much higher but will lower some areas. You can see that *nominal* has a rather nominal interpretation.

What, then, do you look for in a speaker if you can't count on the impedance being constant? Well, the simplest test you can advise the layperson to do is to measure the DC resistance of a speaker; it will almost assuredly be below the rated impedance, but you know that that is rock-bottom as far as the operating impedance is concerned. This will probably come close to the AC impedance in the 250 to 400 Hz area. Here the DC component of the impedance is much larger than the reactive component. If the speaker has a very low DC resistance (say 60 percent or lower of the rated impedance), don't parallel to the lower limits of the amp's capacity; it's probably too low. Try a series connection instead. (It will improve the damping factor as well.)

These impedance variations will affect other things as well. The actual impedance at the crossover point will affect where the crossover point ends up. Actually, what happens is that instead of a nice smooth 12 dB/octave slope (or some other appropriate slope), there is a final filter/driver interaction full of bumps, dips and other odd behavior. In high frequency compression drivers, this impedance fluctuation can be fatal, since much of the impedance behavior is related to the horn it's mounted on. If there is a substantial rise in impedance at the crossover region, it can reduce the effective attenuation of the filter network at those frequencies. This is why you can run into difficulty when mixing components from different manufacturers, so an 800 Hz passive crossover by any other name might not be. This problem only becomes a problem when using passive crossovers.

This impedance variation will also affect sensitivity measurements. If brand "A" is a speaker with a nominal rated impedance of 8 ohms and the impedance hovers in the 5 ohm region and the sensitivity measurement is done by multiplying the measured voltage by the measured current to get one watt, you get a value for sensitivity, say 98 dB at 1 watt at 4 feet. If brand "B" is a speaker with a nominal rated impedance of 8 ohms and its typical impedance *is* around 8 ohms and it is measured by feeding a signal that is calculated to give one watt at 8 ohms (approx 2.82 volts), you might also get a value of 98 dB at 1 watt at 4 feet. *Now* when you take these two speakers with the same sensitivity in the specification sheet and do an A-B comparison using a typical direct coupled amp, one measures out to be a couple of dB louder (Brand "A" as it turns out). Because of its lower impedance, it draws more current from the amp even when they are both receiving 2.82 volts input, so it gets more power. Very few manufacturers have indicated which method of sensitivity measurement they use; there are some who now do tell us if it is the VxI method (volts x amps) or the V method (voltage). If you see them both on one spec sheet, compare the two figures and see how much difference there is.

With simple test gear you can play with the speaker and find out how much fluctuation there is. This can be accomplished with an audio oscillator, scope or voltmeter and a 1000 ohm ½ watt resistor, or you happen to have one, an impedance bridge. (If you have one of these you probably know what to do with it.) Follow the diagram in figure 2. If you make the assumption that most 15" bass speakers have their minimum impedance at about 250 Hz (most seem to), you can approximate this to be equal to the DC resistance of the voice coil. Set the oscillator output so the voltmeter scale shows the same value in millivolts as the DC resistance. Then you can sweep the oscillator and get a good approximation of the changing impedance with frequency.

I think it can be seen that in high power, expensive sound systems the nominal impedance rating of itself might not tell you enough to prevent destruction of amps and speakers.

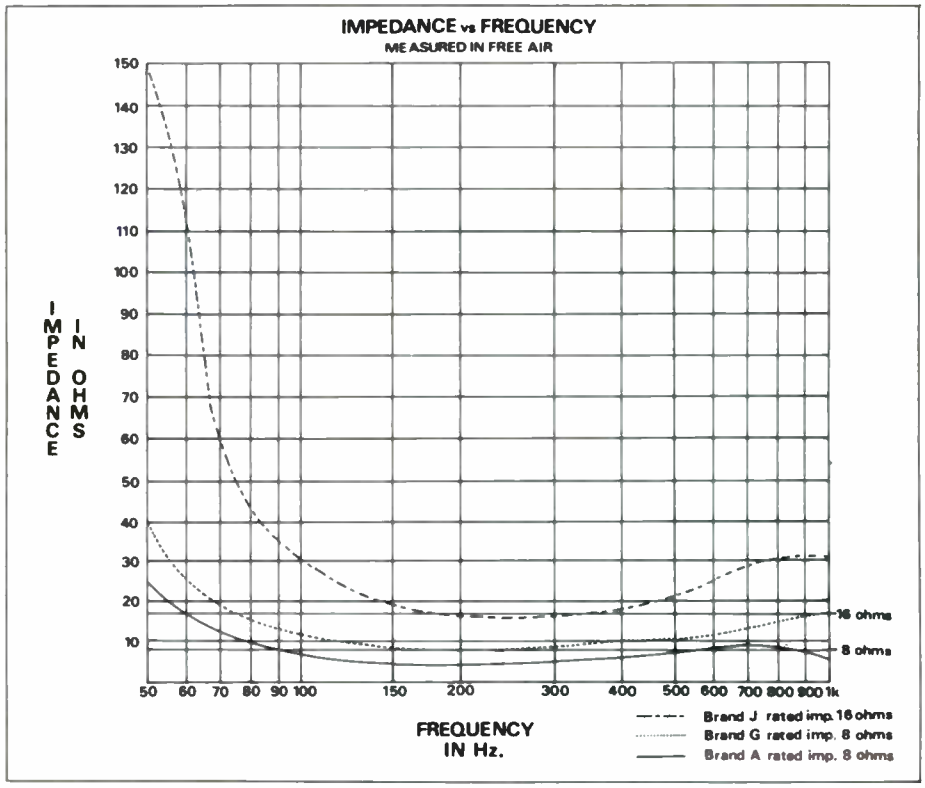


Figure 1

Now that we have looked at loudspeaker voice coil impedance variations with changing frequency and how that may affect applications, we should look at the effect the heating of the voice coil has on impedance.

The voice coil of a speaker is not a mere resistor. There are several impedance components that make up the total impedance that the amplifier will see at the speaker terminals. These other components include the voice coil inductance, motional or mechanical impedance, acoustical impedance, etc. All these have effects that contribute to the overall impedance in steady state measurements. The

inductance in conjunction with the voice coil DC resistance gives the rising impedance with increasing frequency, the resistance in conjunction with the mechanical resonant circuit of cone mass, compliance and suspension losses gives the rising impedance with decreasing frequency. The acoustical impedance loading or matching of the enclosure modifies the impedance by changing the net mechanical impedance. Much like an electric drill will draw more current when it is stalled due to a change in its motional, mechanical impedance characteristics, so can a speaker's impedance change when used in different types of enclosures. There are also several obscure fine points that would not be of concern to most people, such as the dynamic component of the voice coil inductance caused by the pole piece as the voice coil moves alternately in and out of the gap. This would mean that the low pass filter formed by the voice coil resistance and inductance would be changing at the number of times per second that the coil is moving. (This is why nobody bothers with it; the calculations would fill a phone book).

Recently, many people involved in audio research have begun to look at dynamic measurements of transducers because they have found that steady-state measurements don't give enough information about the characteristics of the device. The voice coil resistance is subject to change with input power. Like a light bulb or any resistor, the resistance of the voice coil will increase with increasing temperature. As the power to the loudspeaker is increased, the voice coil temperature will rise, and likewise the resistive component of the impedance. Luckily the voice coil reaches its new temperature quite quickly due to the relatively low mass involved. As an example, most prototype bass speakers with a rating between 150-200 watts and a nominal impedance of 8 ohms will have an operating temperature of 175°-200° Celsius. The voice coil will reach that temperature from a zero input level at room temperature to full rated power in under one second. The impedance will rise from its cold value as much as 60-70 percent in that time as well. The resistive component is the temperature sensitive aspect. We might not expect the impedance change to be linear within the bandwidth of the speaker, since the resistive component dominates the impedance in the midband of the speaker—with mechanical and electrical inductance of the voice coil having the greatest effect at either end of its pass band.

With this information in mind, we might expect the impedance change to be the most dramatic in the midband, since this is also the typical location of the minimum in the impedance curve. This band should be attenuated slightly as the power is increased. The change in resistance in conjunction with voice coil inductance should also change the frequency the low pass filter operates at (with a 60-70 percent increase in resistance it could raise a good portion of an octave in frequency), which should change the response characteristic in the upper portion of the speaker's pass band. While the changes may be fairly subtle

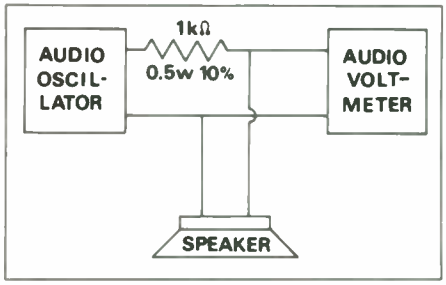


Figure 2

How to be in two businesses at once

The semi pro business, the pro audio business, or is it the creative audio business? Nobody really knows what to call it, but everybody agrees that it's growing...fast. If you're a music dealer who wants to expand your business into this growing area, you've probably got a lot of fears.

Well, at MXR we've got four ways for you to make your transition into the pro sound business a lot easier...the MXR Professional Products Group. You'll find our Digital Delay, Dual Fifteen and Thirty-One Band Equalizers, and our new Flanger/Doubler to be so versatile that they will sell with equal ease to your musical instrument customers, PA customers, or your new home recording and studio customers, and we've put in features to insure it. Our products have been designed so that their controls are easily understood and used. The Digital Delay and Flanger/Doubler can accept either musical instrument or line level inputs. All four products can be either rack mounted or housed in our own optional road case, and you know they're constructed to perform great in any situation.

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CIRCLE 92 ON READER SERVICE CARD

since we are talking in terms of a couple of dB difference, it may not sound too significant, but the thing to keep in mind is the fact that these aspects are not restricted to steady state signals. This gives us a speaker whose response must be altered in a direct relationship to its input signal's dynamic power content and the resulting change in impedance. Luckily, the voice coil has thermal inertia, that is, it takes time to heat up and time to cool down again which has the effect of smoothing any rapid response irregularities that might otherwise show up.

Another effect it has, though, is a change in the impedance that the amplifier sees. A speaker with a nominal impedance of 8 ohms and a DC resistance of 6 ohms, corresponding to the minimum impedance in the midband, might rise to an impedance of greater than 10 ohms in the midband and alter the amount of power available to it from the amplifier. Because the magnitude of the resistive component of the impedance is smaller in relation to the mechanical characteristics effect on either side of the midband, the net effect on the impedance there should be smaller but still noticeable. This is a good news-bad news story if there ever was one. On one hand the tendency for the impedance to rise is a sort of thermal limiter that will help the speaker survive brief high energy transients that might otherwise be too much for the speaker, but it also will change the dynamic range capability of the amplifier/speaker combination by effectively raising the impedance of the speaker system you have attached to the amp. This may be of particular concern when using direct coupled amplifiers.

While the end user of the speaker is in no position to change many of these characteristics, it may offer some credence to the heart-felt belief of many that some speakers do sound better at loud levels than they do at low levels, or that some speakers sound better loud than similar speakers do. Since the thermal characteristics are dependent upon such things as voice coil mass, dissipation capability, materials, etc., no two speakers will exhibit the same thermal-dynamic changes. Since we do have to live with what the speaker does, this may help us to understand another tiny event in the rather complex dynamic life of the loudspeaker. As the old saying goes, "I understand it, but I don't have to like it!"

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Making Good Sound Better

CIRCLE 99 ON READER SERVICE CARD

The SOUND SH

The kind of performance that a bass player demands from an amplifier is much different from that which a guitar player might demand. Whereas a guitarist usually wants distortion and sustain, a bass player wants a clean sound and lots of "punch" from his rig.

Because of this, **Acoustic** amps have long been popular with bass players. These solid-state amps have a clean, bright sound; they're rugged, and they have a good warranty.

The Model 118 Bass Amplifier is exemplary of the Acoustic line. The amp is small, yet it packs a good punch. The 50 watts RMS power amp has less than 5 percent THD. One front-loaded 15" speaker with an impedance of 8 ohms is housed in the cabinet, which is a tuned reflex design.

To insure that the cabinet doesn't rattle, the corners have been interlocked by the dado construction method. The cabinet is covered in heavy black vinyl with reinforced steel corners. The total self-contained package weighs only 76 lbs.—light enough for one person to handle.

The Model 118 has a hi- and a lo-gain input, a power boost switch, a bright switch, three separate tone controls, a line output and LED status indicator. Dealers shouldn't have any trouble moving this amp with good results, provided they keep in mind that the bass player always needs more power than the other players in the band in a live performance situation. The 118 is a great little studio amp. As a live performance amp, its applications are more limited. Rather than undersell the customer, it might be better to move him up to something more powerful if the situation calls for it. Acoustic has plenty more powerful amps available, you can be sure!

CIRCLE 10 ON READER SERVICE CARD

Disco. A plague and a pestilence to some, a blessing to others. Regardless of personal feelings, disco can mean dollars to the dealer who is equipped with disco outfits. A couple of turntables, a mixer, a power amp and a couple of speaker enclosures is all a disco deejay needs to make his music, *but* the deejay definitely needs something to protect his equipment with, especially if he is working a lot. Once the enterprising record-spinner gets an eyeful of the "Disco 1" road case outfit from **Calzone Cases**, he won't be able to turn his mirror ball off until he has a set of cases of his own.

Calzone's outfit consists of four cases. One case, complete with padded armrest, will accommodate two turntables and a 19" rack-mountable mixer. This case's interior foam lining can be cut precisely to fit the turntables, and the excess foam is then glued to the inside of the top of the case to insure shock-free transport for the tone arms and delicate parts of the turntables.

Two large cases, mounted on casters, serve as the base for the case which houses the turntables and mixer. These cases hold the power amp(s), cassette deck, graphic equalizer and other such gear, as well as having room for

OPPE

By Charlie Lawing

record albums in one of the two cases. A fourth case is designed for carrying albums only. Together these cases make quite an impressive package. A disco deejay can roll this rig into a place, set the entire system up in ten minutes and be ready to boogie. A must for the *serious* wild and crazy get-down kind of guy.

CIRCLE 11 ON READER SERVICE CARD

In response to a genuine demand from consumers for a simple yet flexible self-contained control center for small sound reinforcement applications, **Peavey** has designed an integrated mixer/power amp system, the XR-700. The demand for this product comes from those people who want good quality sound, but don't want to spend a lot of time fooling around with hooking it all up. Solo or duo acts, small groups, churches, schools, and small clubs are always looking for something that is easy to use, yet flexible enough to accommodate various effects, monitor sends, good E.Q. and so forth.

The XR-700 is actually a *dual*-powered mixer; it has two separate power amps built in, one for main and one for monitor (each amp delivers 120 watts RMS into 4 ohms). However, the XR-700 is not a stereo system; it operates in mono for the sake of simplicity and economy.

Each channel of the XR-700 has an independent "pre" monitor send, three-band E.Q., hi/lo impedance inputs, and in/out patch capabilities.

The master control section of the mixer, aside from having the usual controls, has a couple of unique features. Reverb or effects can be returned to the monitor mixing bus, and blended in with the monitor mix as desired. In addition, the rear panel master section contains complete patching capabilities, such that the unit can be interfaced with external units, and patched around or into the graphic equalizer.

Each side of the mixer (main or monitor) has a seven-band graphic and a ten-step LED display which indicates the level of each of the two amps.

The XR-700 is a low-cost, relatively simple unit; in short, a good buy for the money, which is precisely what has made the Peavey equipment so popular today.

CIRCLE 12 ON READER SERVICE CARD

The **Ibanez** Musician Series is a line of guitars that incorporate as their primary design feature a laminated maple and walnut neck that extends the entire length of the instrument. The design is not new; Alembic has had it for years, but Ibanez has added some touches of their own which make this new MC 900 bass worth mentioning.

Most importantly, the EQ Tone System that worked so well on the Ibanez Artist guitar has been re-calibrated for bass frequencies and added to the MC 900. The result is three individually-adjustable bands of EQ: Bass—80 Hz; Mid—500 Hz; and Treble—1.5 kHz. This tone-altering device enables the versatile bassist to get a deep bottom sound as well as a bright "plucked" sound that is indicative of contemporary taste.

Additionally, the MC 900 has a combination bridge/tailpiece that functions to enhance sustain and keep the bass in tune. Each string can be individually adjusted for height and intonation. The eyelets that hold the strings in place on the bridge are slotted, so that strings can be changed quickly.

The MC 900 has two pickups which are mounted much like the pickups on the Musician Series guitars; set wide apart but not quite flush with the end of the fretboard and the tailpiece.

The fretboard itself is 22 frets on a 34" scale; the bass machine heads are Ibanez Valve-Tune heads, with a high gear ratio.

CIRCLE 13 ON READER SERVICE CARD

Every year around Christmas time the cry goes up for a decent "beginner" electric guitar that will *tune up*! Most of the extremely low-end instruments that retail for under $200 are more trouble than they are worth because of the poor quality. Dealer servicemen end up spending hours trying to adjust instruments that simply cannot be tuned for more than a few minutes before the neck moves or the bridge moves or the tuning gears slip; next week the guitar comes back again because of faulty wiring; there is no end to the problems associated with most of these so-called "replicas."

Ibanez now offers three models in a solid body electric series called the "JR's." These "junior" models are patterned after three

Ibanez professional series designs, namely the Studio, Artist, and Iceman series. The JR's are aimed at the low-end guitar market, yet they have surprisingly good quality for the price. Furthermore, they carry the Ibanez brand name, which has become accepted among professional players.

CIRCLE 14 ON READER SERVICE CARD

RolandCorp has a "totally new concept in musical instrument amplification and effects—the Roland Rack." The idea of making guitar amplification, pre-amplification and signal-processing a modular concept is a good one.

What it amounts to is this: Roland has a total of nine rack-mountable units which can be mounted together in the Rack in various combinations. Two pre-amps, two power amps, and five signal processors give the musician plenty of options to choose from. Beyond the basic necessity of pre-amp and power amp, the musician can add the various effects units as his budget permits. The Rack itself will hold as many as seven of the nine units in the series.

Basically there is one setup for guitar and one setup for bass guitar, with effects that can be added to suit each individual's taste. The SIP-300 is the guitar pre-amp which, although it is solid-state, will produce the

the SOUND SHOPPE
REAR ENTRANCE

"warm over-driven tube amp sound," according to Roland. This overdrive circuit is controlled by a sensitivity and a level control and can be activated with a footswitch.

On the bass guitar pre-amp, the tone controls, inputs and outputs, and effects loop are the same as the guitar pre-amp. The only difference is that the bass pre-amp has a compressor rather than an overdrive circuit.

The two power amps are designed to correspond with the guitar and bass pre-amps and are rated at 60 watts per channel at 8 ohms (the SPA-120) and 120 watts per channel at 8 ohms (the SPA-240).

The Roland Rack is a step forward in terms of sophistication.

CIRCLE 15 ON READER SERVICE CARD

The **Beyer Dynamic** M 500 ribbon microphone is now available, which should come as good news to vocalists. The M 500 is designed to be free from popping, breath noise and hissing. It has a frequency response of 40 Hz to 18 kHz and a sensitivity of −60 dB. The balanced 200-ohm output couples with the standard Cannon plug, and of course low impedance means no signal loss due to lengthy mic cables.

Vocalists will be particularly impressed with the smooth rise in the critical midrange frequencies, which adds strength and projection to a singer's voice without sounding false.

The new **Sansui** 5330 cassette deck is compatible with the latest innovation in tape composition, the metal-alloy tape. Because metal-particle tape requires approximately twice the bias and erase current of conventional chro-

mium dioxide tape, a new head material—a compound of iron, silicon and aluminum—was developed by Sansui. This head material is used on the record/playback head of the SC-5330; the erase head is a double gap ferrite unit with a rated erasure factor of 70 dB. The 5330 is a front-loaded system with full logic control. The 5330 also has a tape lead-in feature for proper recording of the beginning of each record. The 5330 is Dolby-equipped, rack mountable and capable of handling both metal-particle and conventional tape formats.

CIRCLE 17 ON READER SERVICE CARD

Once again we turn our eyes southward to Garland, Texas, and **PM Audio**. Gary Pelfrey's "little company that could" has a new speaker enclosure in their line, the Model 701. This enclosure is a dual-12″ speaker system with one piezo for crisp high-frequency response. The 701 has a maximum power input of 200 watts (continuous program); a frequency response of 50-20,000 Hz; maximum sound pressure level of 110 dB and a dispersion of 90 degrees. Nominal impedance can be 4 or 16 ohms. The Model 701 is finished in black fiberglass, weighs 50 lbs., and is available for immediate delivery from PMA.

CIRCLE 18 ON READER SERVICE CARD

By John Parris Frantz

DEALER DOSSIER

Elektrik Keyboard
Chicago, Illinois

Even before computers appeared on their showroom floor, Elektrik Keyboard was considered an unusual music store. They didn't sell guitars or P.A.'s or accessories. Their main thrust in the market was solely synthesizers and electric pianos. They have specialized in this branch of musical instrument retailing by carrying virtually every brand of electric keyboard available to the consumer.

SOUND ARTS went to Chicago to find out more about this unique operation from President Jim Head and Vice-Presidents Tony Gallina and Ken Zemanek. Head, the founder of Elektrik Keyboards, after receiving a Bachelor's degree in aeronautical engineering, went to Arp Instruments, Inc. as a district sales manager. It was at Arp that Head received his valuable knowledge of electronic music and its technology.

All of the people at Elektrik Keyboard are accomplished musicians, which emphasizes the store's philosophy of catering to the customers with competent showroom demonstrations. Along with this philosophy they prompt a friendly and low-pressure sales technique. It's not unusual to see one of their salesmen playing Frisbee with potential or past customers who frequent the store just to say hello or to find out what's new with synthesizers. Because Elektrik Keyboard deals with low volume and high-priced equipment, their salesmen have time to talk and demonstrate items at length. Their most important philosophy however, is to assure that each sale is accompanied with proper education on the instrument's functions. This method can take days or even weeks, depending on the customer's previous training in electronic music.

Why did you incorporate computers into an already exclusive music retailorship?

Head: Because of the rapid growth of computer technology and synthesizers that have started to use computer programing. Computer music is one of the early forms of electronic music. So the two are closely related.

How did you learn enough about computers to sell them?

Head: I didn't know very much about computers before we incorporated them into our business. I did about a year's research by going to computer stores and shows. I also did a lot of reading on the subject. Then I made a decision on what I thought was the best computer for our applications, which turned out to be the Apple. The Apple computer was about two years old at that time. Basically I picked it up for the music application. Then we started selling to businesses, schools, and hobbyists. We hired a couple of computer programmers, who by the way are becoming nationally known for their software programs. These programs they're writing are now selling to dealers all over the world. In about two months we'll have the software written for a complete inexpensive computer business system tailored for the needs of music retailers. I also found it extremely necessary in the computer department to have knowledgeable people like we do in the keyboard department.

Before the computer market came into focus for you, this was a store that dealt exclusively with synthesizers and electric pianos. Why did you pick that direction in musical instrument retailing?

Head: I used to be the midwest sales manager for Arp Instruments Inc. We did clinics, sales training, concerts, and called on dealers. We did a lot of in-store clinics. It was at that time that I noticed a large lack of knowledge by salesmen who were supposed to demonstrate or show synthesizers

Photos by Mark Gifford

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TDK's D cassette has long been the budget-priced workhorse of the TDK line that seems to sell as fast as it's shipped. But until now it was the cassette that sold to price-conscious customers who sometimes overlooked the D cassette's quality aspects.

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New D features a vastly improved high end with a 2.5-4.0 dB increase in sensitivity from 10 kHz-16 kHz. Together with an impressive 3 dB increase in MOL at 10 kHz, TDK D offers higher output and lower noise characteristics than most conventional, "High Output, Low Noise" cassettes.

A new hi-grained ferric oxide particle developed by TDK engineers delivers higher, flatter frequency response and wider dynamic range. For tape decks with "Normal" bias or without a bias position selector, the new D cassette will deliver outstanding, high fidelity recordings for playback on mid-priced home decks, portable radio/cassette recorders and car cassette players. In addition, improved D is housed in TDK's acclaimed cassette shell, which incorporates "super precision features found in all of TDK's cassettes.

TDK's new D is still packaged for easy merchandising, still supported by full advertising, co-op and promotional programs, and best of all still selling at the same attractively low price. Put it all together with the unprecedented improvements and TDK's new D gives you a strong story to tell, and a great reason to sell it right off the rack week after week.
TDK Electronics Corp., Garden City, N.Y., 11530. In Canada, Audio Specialists Inc.

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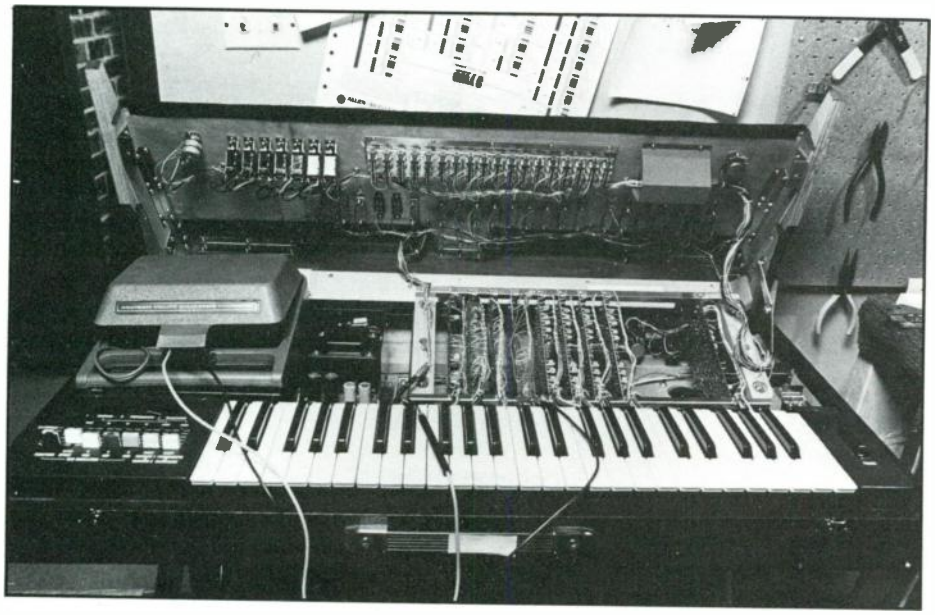
to the consumer. A lot of dealers didn't do business with synthesizers because of lack of knowledge of the instrument. By getting around to many of the states and seeing this I felt there was a definite need to specialize in that area. That's why I decided to open my own business.

How many people are involved in your operation and what are their backgrounds?

Head: I'm the major stockholder in the corporation. We have five full-time and two part-time salesmen. The unique thing about our operation is that everybody doubles. Three of the salesmen are excellent keyboard players and they also play guitar, bass, and drums along with other various instruments. One salesman is also a computer programmer besides being a musician, so he can cross over and do sales or the other salesmen can cross over and sell computers if necessary. They're all players, which I think is important in dealing with people. Everyone can demonstrate any model instrument that we have on the showroom floor.



What is your physical layout?

Head: We have a polyphonic synthesizer room. In another section we keep all of the electric pianos. In a small studio we keep the Yamaha electric grand setup. In the back studio we have the monophonic synthesizers. In each showroom we have a comparable sound system which we would recommend to be used with the instruments. Our repair room could also be used for demonstrations. Our computer demonstration and display room is isolated from the rest of the store. We realize there is a crossover of computers and synthesizers, but we wanted an area where the businessmen could look at computers and the musicians could be isolated from the computers by being in the electric keyboard area.

Gallina: This store used to be a TV commercial editing studio, so consequently most of our room are soundproofed. We put the electric grand in the room that was once used for voice-over announcing. We can close the door in most of our rooms and let somebody play the instruments without bothering someone else.

Can you statistically divide the type of customers you sell to?

Head: For computers it would be 65 percent business applications; 20 percent hobbyists; and 15 percent schools. For keyboards it would be 50 percent semi-pro musicians; 20 percent internationally known groups; 25 percent weekend musicians; and 5 percent schools.

Zemanek: Geographically, we sell to 40 percent local, 10 percent midwest, 40 percent national, and 10 percent international people.

Why do you specialize in synthesizers?

Head: Because I think keyboards are getting a lot more sophisticated—much more than any other instrument. They're becoming more specialized to the point that the player requires a lot more attention and information before he can make a decision on what to buy. It's not like walking in and picking up a guitar and trying it, then trying another one until you find the one that feels rights to you. In synthesizers it could be a single note monophonic or a two-, four-, six-, or eight-note polyphonic. There's a big difference right there. It traditionally doesn't have just six strings as a guitar will. It can come in any different configuration or have many amounts of sound. The way they light up on the panel, control-wise, varies with each individual instrument. The possibilities are enormous. You're not dealing with a fixed instrument, but a very sophisticated variable instrument. In most cases it's his first exposure to it, so a customer needs more assistance.

How much assistance do you provide as far as educating him on how to use it? How far will you go with a customer?

Head: I think basically we offer about as much as is required. We don't set any time limits. Everything is handled on a very individual basis.

Gallina: If a customer comes in and says he wants to add some synthesis to his sound, we usually talk with him at length about what specific things he's looking for. We ask him to cite examples on albums in order to pin down what sounds he's looking for. We carry every brand of synthesis so we're able to go through every unit and find out what its strong and weak points are. Then if the customer does buy a unit from us, we like to spend a sufficient amount of time with him before it leaves the store. Then two weeks later is he's still having trouble, we like to have him come in and we'll go over the unit again and again until he understands its functions.

Head: I think when you're selling instruments that sell for a pretty high price tag, you have more time to spend with a customer as a result. This is not a volume-type of business as are guitars and amps.

How do you handle the service end of the business? How do you find competent servicemen?

Head: We handle it in several different ways. First of all we're fortunate enough in Chicago to have two service companies in Watts Electronics and Music Dealer Service, that are set up specifically to handle music dealers. Depending on types of problems like who's covering the warranties, they usually handle things for us. We also do some equipment modification and service work here at the store. Trying to have a full-time serviceman here is probably the most difficult thing to do.

Gallina: Dealing with instruments with so many intricate parts, it's hard to stock all of the parts you need.

Head: We also have a serviceman come in here two days a week who can service everything, including the computers.

Gallina: If a customer is in need of a replacement while his unit is being repaired, we usually give him a loaner that same day so he never really misses it.

What type of advertising and promotion do you do?

Head: We run full and half-page ads nationally. We also do some advertising in more specific journals depending on what area we're trying to reach. For example, if we have some good computer programs that can help some attorneys out, we'll advertise in a legal newspaper. We have a party each year as a thank-you promotion. We have two or three groups playing and set up umbrellas and tables. This is mainly for our customers and the people that we deal with.

What product lines do you carry? Which are your hottest selling brands?

Head: It's probably easier to say what lines we don't carry. We handle Yamaha, Arp, Oberheim, Sequential Circuits, Moog, Roland, Korg, Crumar, Neptune, Quilter Audio, Hohner, Wurlitzer, Fender Rhodes, Steiner-Parker, Bose, Computone, and 360 Systems. I'd have to say Yamaha, Sequential Circuits, and Oberheim are our hottest items.

How do you view the state of the computer market?

Gallina: This would be a good time to interject a point. When people first come in contact with us they can understand the keyboard and synthesizers in terms of our backgrounds, but they ask, "Why the computer store?" The fact is that we got into the micro-processor area a little over a year ago and after a year we can really see the interconnection between the two. All of the new products of any consequence and all of the new things in the music industry have some kind of digital input by using the microprocessor. We carry the Apple computer here. It can be interfaced with analog synthesis. It now has music boards that will generate their own tones. So what's happening is that two entities that look like they're separate are in the process of coming closer together. As for the direction in the market now, it is important for us to keep an eye on the computer situation and keep it well in hand by working with it on a day-to-day basis in conjunction with keyboard synthesis as the two keep coming closer together.

I know you've only handled computers for one year, but is it possible to see a trend with computers as a percentage of your gross sales?

Head: It seems to be having a very steady and healthy growth. Our sales last year were around a quarter of a million dollars. This year we've doubled that figure and I would say 25 percent of that is a direct result of our computer sales.

What's next for Elektrik Keyboard as far as computers?

Head: We're expanding. Atari has a nice line of home computers coming out in the fall, which we'll be carrying. The projection is by the mid-1980's computers in the home will be as common as stereos and televisions. The purpose will be for home management, energy control, education, telephone purchasing, family entertainment. The reason computers haven't reached this point yet is because people haven't been educated well enough on them.

What about your competition? Have any more stores opened up that sell exclusively in keyboards?

Head: San Francisco and Cincinnati have stores that are similar to us. I think you're going to see a trend toward more specialized stores.

What type of keyboard is experiencing an upward trend in sales?

Head: The polyphonic keyboards.

You stated earlier that you were experiencing a regression in electric piano sales. Do you think the synthesizer will eventually replace the electrio piano?

Head: I don't really see synthesizers replacing electronic pianos. I think they're almost complementary. It's almost necessary to have both. We're seeing a trend of people spending more money or getting higher priced pianos like the Yamaha electric grand. There's not necessarily a trend toward lower sales in electric pianos.

What type of mixers, amplifiers and speakers do you recommend for the synthesizers you sell?

Head: We use the Yamaha, Neptune and Bose lines. We don't try to stick to one matched system necessarily if we can find isolated things that can serve the purpose. It depends on the price range the customer's interested in.

What is your major inventory problem?

Gallina: Every specific product runs

in spurts. For example, if you finally sell one of a certain item, then all of sudden you'll sell five, six, or seven of them in a row. Then they'll level off for a few months. So when you get these spurts where everybody is buying this one product it's hard to keep them in stock.

Could you cite some examples of modification work you do with your stock equipment?

Gallina: Dave Thiel, our technician, does some modification work with the Yamaha CS series. He's actually changed the analog boards. If a customer isn't particularly happy with a stock sound, Dave can change it to fit the customer's taste. All of this information is stored on computer, so consequently if he's going after a particular string sound we can punch up that computer program and it will tell us what to change. Dave wrote that program. So once again you can see how the computer area intermingles with the music synthesizer's area. It's a time saving thing and it's also accurate. We've also designed some joy sticks and multiplexing boards for the computer.

So you're capable here of doing any custom work that a customer may request.

Head: That's right.

What is your square footage allotment for specific types of equipment?

Head: Basically we have about 1200 square feet of showroom areas and studios. We have another 1200 square feet downstairs which is used for classrooms, offices, and storage areas.

Why do you have classrooms?

Head: We're going to start computer classes very shortly and we've already held synthesizer classes here. They can also be used for clinics.

Do you hold classes for profit and promotion?

Head: The classes are more or less for educational purposes. We also get promotion from them. Hopefully a lot of these people are either interested in synthesizers or computers and they want to know more about them before they make a decision to purchase. Then hopefully they will buy from us.

In your opinion, have the standard music retailers in Chicago, who carry everything, shown signs of diminishing sales in the electric keyboard market? Have you pretty well cornered the electric keyboard market by specializing?

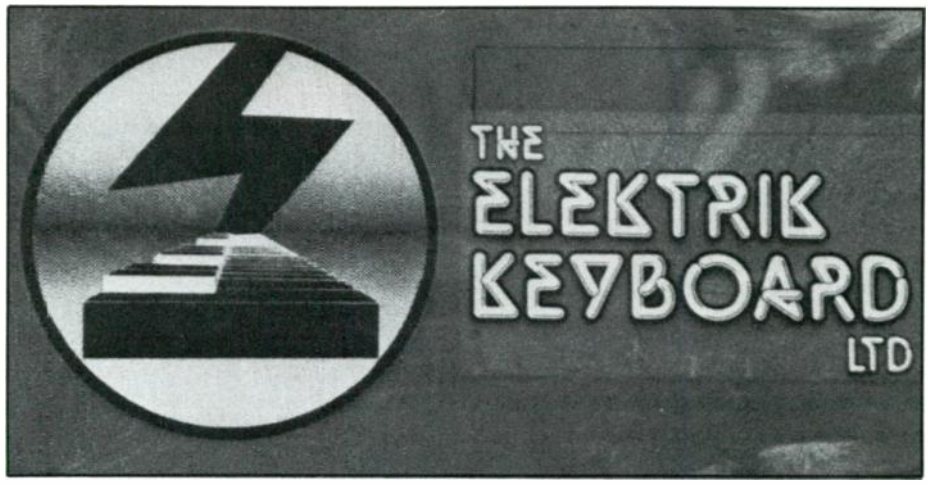
Gallina: A lot of the other stores, because they have to stock drums, guitars, amps, etc., don't have the funds in their budget to stock a large number of synthesizers. Plus they don't always have the knowledgeable people to sell and service them. So for the more expensive items like the polyphonic synthesizers, they refer their customers to us. They still take their chunk of the business from neighborhood sales and the less expensive electric keyboards.

Head: We have a good working relationship with all of the dealers. In fact a lot of dealers refer customers to us who are interested in the more sophisticated things. It's still an expanding and growing market. Everybody is getting their share. Our share happens to be the higher priced and more professional and sophisticated type of synthesizer.

How did you get such a good and working relationship with the other dealers? When you first opened up did you call all of them to make yourself known?

Head: I called on most of them when I was with Arp. I knew most of them before I went into business. In fact, because I was in the wholesale business at one time, I met dealers from all over the country, which accounts for our sales outside of the Chicago area. Plus I worked and helped a lot of top name groups incorporate synthesis into their sound when I was with Arp.

Do you offer consultation to other retailers who are out of your general competition area?



Head: Yes. Always.

Gallina: Sure. Even that exclusive electric keyboard store in San Francisco called us about four months ago and said they were looking for another line of synthesizers and asked us what we thought of this, this, and this. We gave him honest opinions of each one. We're in a situation where we don't have to be hidden or secretive.

Head: Even dealers in Chicago will call us up and ask how to hook something up or how to get a sound from a particular synthesizer. We're never opposed to answering any questions. I think that's a unique situation in this business.

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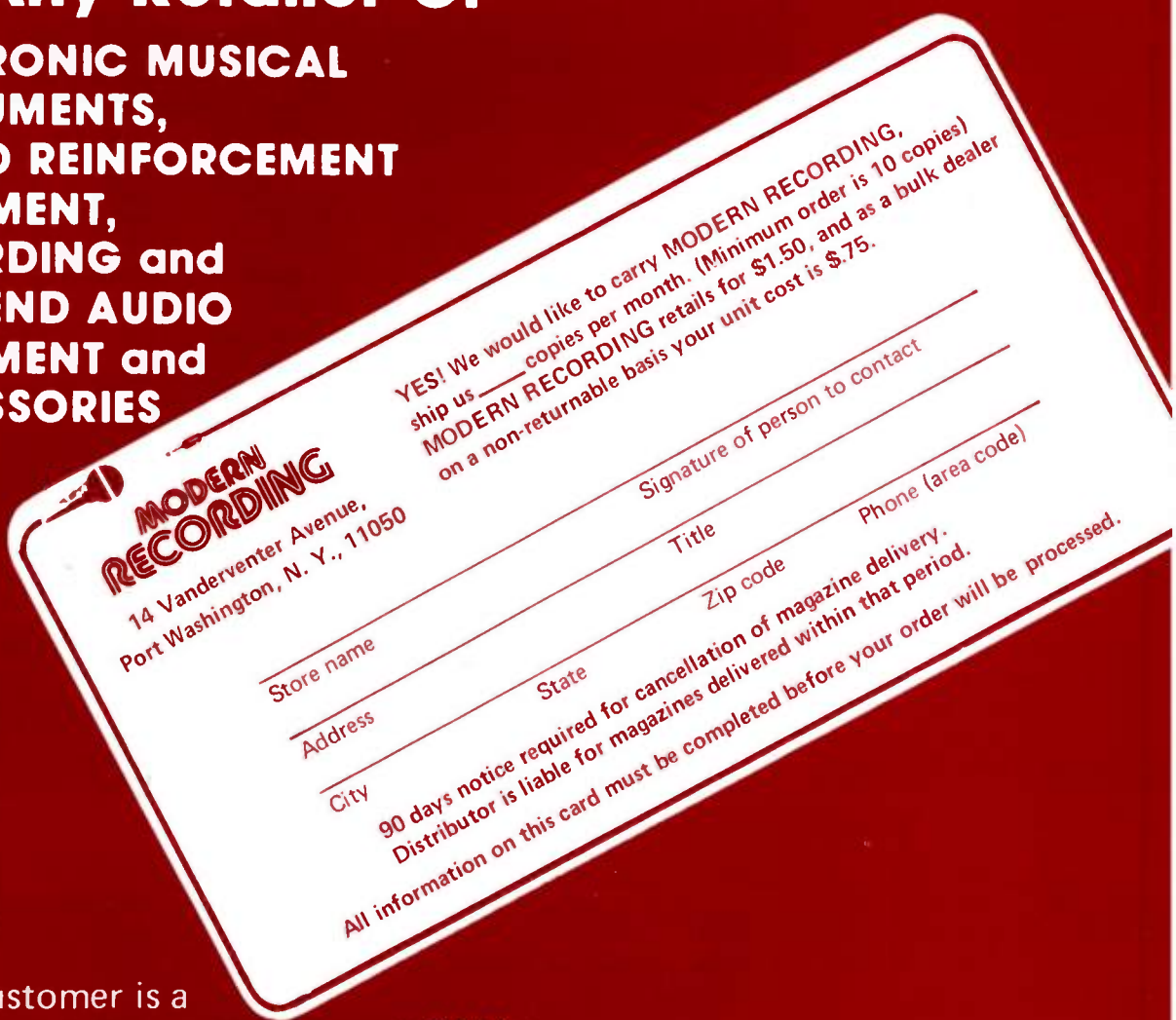

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INDUSTRY UPDATE

Bernie Mitchell has resigned his position as President of U.S. Pioneer Electronics. He will continue as a consultant to the company. As a successor to Mitchell, an Office of the President has been established, consisting of **Tamotsu Iuchi**, Executive Vice President; **Ken Kai** and **Barry Shereck**, Senior Vice Presidents; and **John Hall**, Vice President, "all assisted by and under the guidance of Bernie Mitchell."

Barry Evans has been appointed National Sales Manager of the Revox division of Studer Revox America. Evans expects to "revamp our sales organization and become more responsive to dealers' needs."

James B. Lansing Sound, Inc. has appointed **Ron Means** Manager of the Professional Division. Means previously held sales management posts with Altec Lansing and University Sound.

Curtis Pickelle has been appointed Director of Communications for James B. Lansing Sound, directing the company's marketing services operations, including supervision of national advertising and dealer co-op materials, and rep and dealer newsletters. Pickelle was previously director of the marketing communications department of Altec Lansing.

Metone has appointed two additional distributors to carry its line of electronic metronomes. Midco International is now exclusive distributor in the midwest, while Boosey & Hawkes will represent Metone throughout Europe.

A new company, Audio Pulse Electronics, Inc. has purchased the Audio Pulse Division of Gould, Inc. **Francis J. Kelly, Jr.** becomes Chairman and CEO. **Don R. Becker** is President; and **Don J. Cole** becomes Vice President. All three have been associated with Audio Pulse for the past two years.

James L. Camacho has been appointed Director of Corporate Marketing at dbx with management responsibility for corporate marketing functions for both consumer and professional products.

Peter V. Ferguson has been named Advertising Director for Bose Corporation. Ferguson was previously with the American Optical Corp.

BASF Systems has named **Bob Piselli** Sales Manager of Professional Products, a newly created post with responsibilities for selling the company's line of duplicator tapes and calibration test cassettes.

In a "major realignment," Kenwood has promoted **Lowell Yamaura** to National Sales and Marketing Manager for the Audio Purist Group. He was previously Senior Sales Manager at Kenwood; he will remain based in Secaucus, NJ.

The American Guild of Disco Programmers has appointed **Paul Friedman**, National Sales Manager for GLI Integrated Sound Systems, as an advisory member of its executive board. The American Guild is a newly formed organization of disco djs, studio mixers and effects operators working to develop professional standards in the disco industry.

Ken Kohda, Vice President of TDK has assumed the additional title of General Manager. His additional responsibilities include primary accountability for all U.S. sales and marketing policy.

Joseph Giunti has been appointed Customer Service Manager for GLI Integrated Sound Systems.

Glenn Urgel has been named Western Regional Sales Manager for the Audio Component Division of Hitachi Sales Corporation. Urgel was previously with BES and JBL.

Audio-Technica U.S., Inc. has named **John J. Hess** to the newly created position of Marketing Manager for Audio-Technica's audiophile records line.

Phillip G. Flora Associates has been named manufacturers representative for the state of Michigan for Integrated Sound Systems, manufacturer and distributor of GLI. **David Ripp** of Sounds Unlimited, Richmond, Indiana has been named Dealer of the Year by GLI.

Norm Wieland has been named National Sales Manager of Burns Audiotronics, Inc., exclusive distributor of Beyer products. Wieland was formerly Product Manager of the Beyer division at Hammond Industries, the previous distributor.

Ken Pessara, Jr. has jointed TDK Electronics as National Video Product Manager, a newly created post. Pessara was most recently Video Product Manager of US JVC Corp. and was with Ampex Corp. before that.

Robert A. Perry has been named Sales Manager for Fender in the northern Illinois and Wisconsin area.

Lafayette Radio has appointed **Stephen Jeffery** Vice President of Marketing. Jeffery joins Lafayette from Harman International Industries, where has was Vice President, Marketing-International Division.

Electro-Voice has appointed **Tony Satariano** High Fidelity Products Marketing Manager. Satariano comes to E-V from the Koss Corporation, where he was Midwest Regional Sales Manager.

Don J. Ruehle has been promoted to Area Sales Manager, Retail Products, for 3M's Magnetic Audio/Video Products division. Ruehle will be responsible for a newly created southwest area branch, headquartered in Dallas.

Jim Alderden has been named Marketing Director of American Acoustics Labs. Alderden was formerly president of Comark Advertising and Public Relations.

Michael W. Ragsdale, former President and founder of Uni-Sync, Inc., has formed a new pro audio group called AudioLogic Corp. located in Westlake Village, California. The company's first product is the Discorama Disco Mixer.

MCI, Inc. has entered into a licensing agreement under which the company will manufacture digital tape recording equipment based on technology developed by EMI. Production models of the MCI JH-220, a two-channel stereo tape recorder and the first machine to be developed under the agreement, will be available by the end of the year.

At an Industry Workshop held by MCI, Inc. representatives of several recording studios formed the Society of Professional Audio Recording Studios, an association of studio owners.

Eventide Clockworks is holding a contest which asks contestants to write a program for the Commodore Pet computer and Eventide real-time analyzer which, by studying rhythmic content and frequency distribution, could identify disco music. The program must be submitted on a Pet cassette and should be in Pet basic. Closing date is December 31. Contact Eventide for further information.

Jon Pichler has been named Sales Manager for Fender/Rogers/Rhodes in Arkansas, Louisiana and Mississippi.

Tom O'Donnell has been named Director of Marketing for Rhodes Keyboard Instruments, responsible for marketing and marketing development of all Rhodes keyboard instruments and amplifiers.

Shure Brothers has promoted **Joseph J. Kaleba** to the position of Vice President of Manufacturing. Kaleba was previously Assistant Vice President of Manufacturing.

The Recorder Care division of Nortronics Company has named TMC Sales Corporation representative for New York City, Long Island and eastern New Jersey.

Martin Audio/Video has named **Gordon L. Clark** Technical Manager. Clark was previously with Audiotechniques, Datamix and Sound Center Studios. **Tim Holmes** has been promoted to Service Manager. **William H. Dexter** has joined the Pro Audio Sales Department. Dexter was previously in the Parts Department.

John Borowicz and **David M. Kusek,** founding members of Star Instruments, have formed Cognitive Systems, a design and consulting firm specializing in audio and microcomputer based systems, with the main emphasis on synthesizers.

Robert L. Bunting has been named Vice President of Marketing of Pioneer Electronics of America.

Empire Scientific has announced an expanded marketing program for its EMI-brand of tape, which includes the introduction before the end of the year of a second generation of high-bias chromium tape and VHS-format video tape. By the first of the year, the company expects to have metal particle tape.

Jeff Housman has been named National Sales Coordinator for Audio/Video Products of BASF Systems, joining the company from Automatic Radio.

Sharp Electronics Corporation has promoted four executives. **Mike Akamatsu** has been promoted to a position in Osaka, Japan. **Charles Daigneault** succeeds him as Executive Vice President. **Ted Inoue** has been named Assistant Executive Vice President and **Tak Nakano** takes on the new post of General Manager-Business Administration.

Robert T. McCarthy has been appointed General Manager, Philips High Fidelity Laboratories. McCarthy has been with Magnavox since 1978 and was previously with GTE Sylvania.

Koss Corporation has named **Robert C. Bukowsky** Vice President of Marketing, reporting to the chairman of the board. **Jeffrey T. Martin** has been promoted to National Sales Manager of Stereophones. **David J. McLeod** has been promoted to Sales Manager of Premium Sales and National Accounts.

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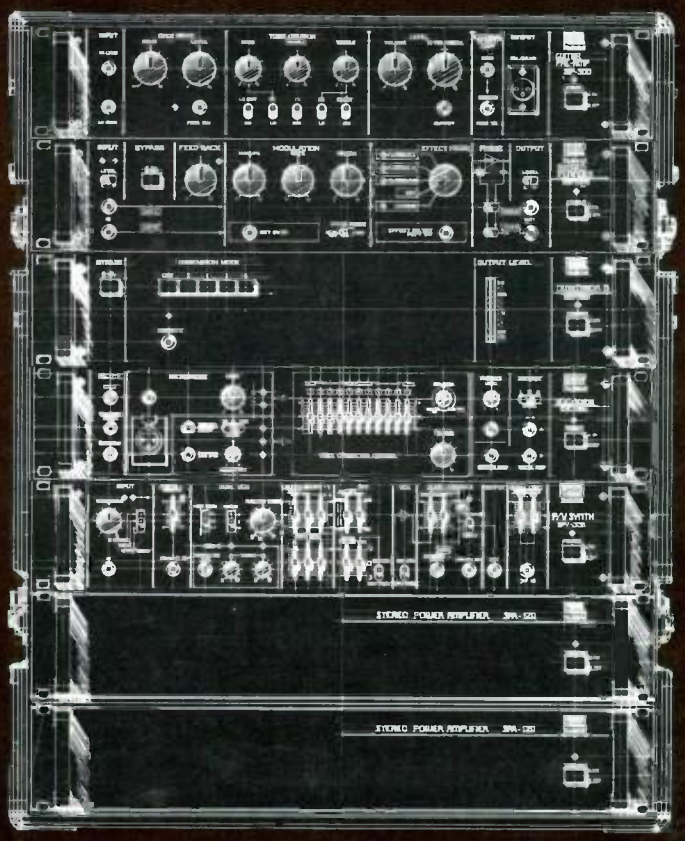

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