

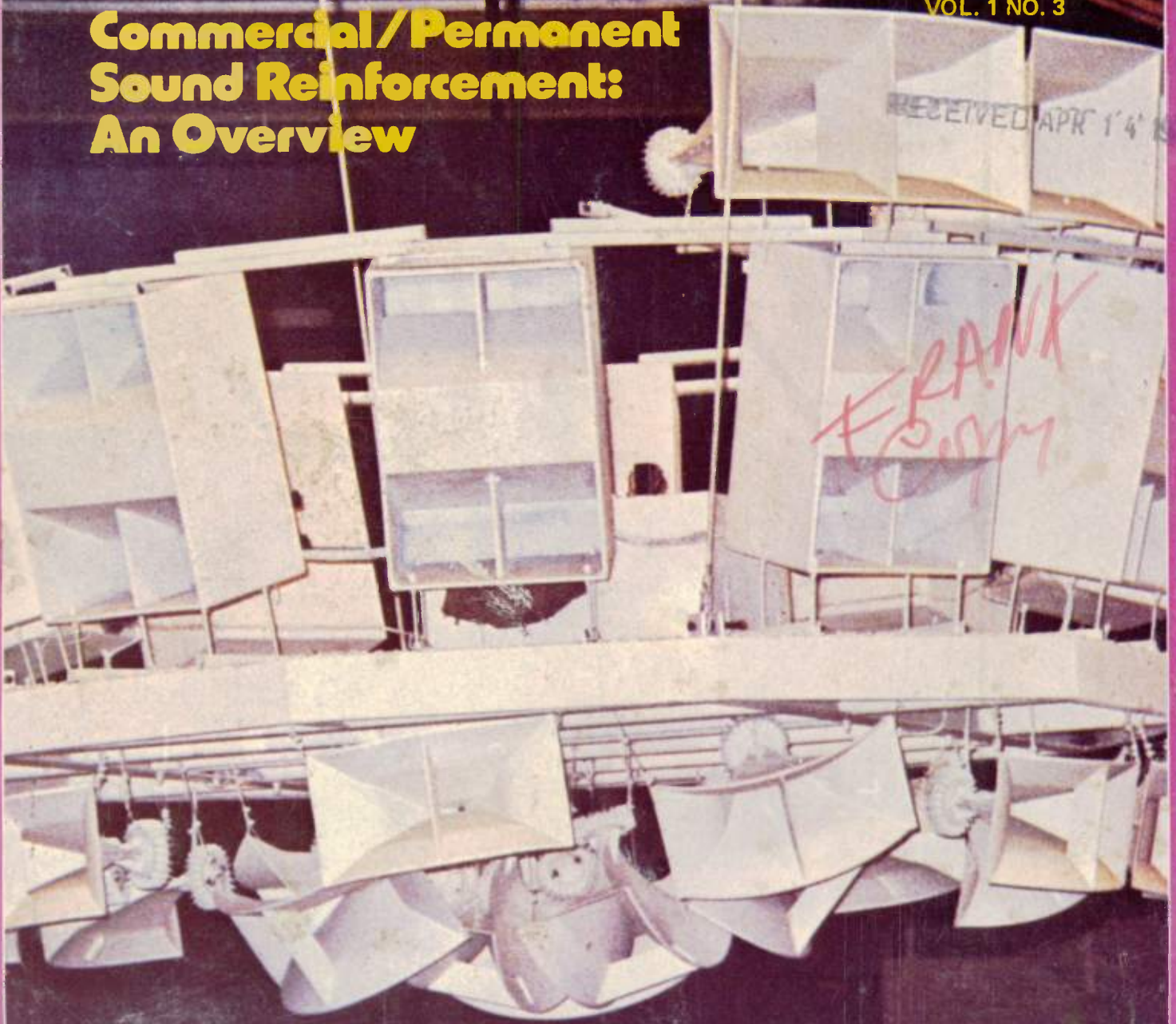
SERVING THE CREATIVE AUDIO AND MUSIC ELECTRONICS INDUSTRY

SOUND ARTS

MERCHANDISING JOURNAL

APRIL 1978
VOL. 1 NO. 3

Commercial/Permanent Sound Reinforcement: An Overview



Guitar Synthesizer Part II – A New Wave
Collectors Item – An Amazing Guitarist
With A Fantastic Collection

K.I.S.S. keep it simple stupid – A Marketing Qualification

*In this studio,
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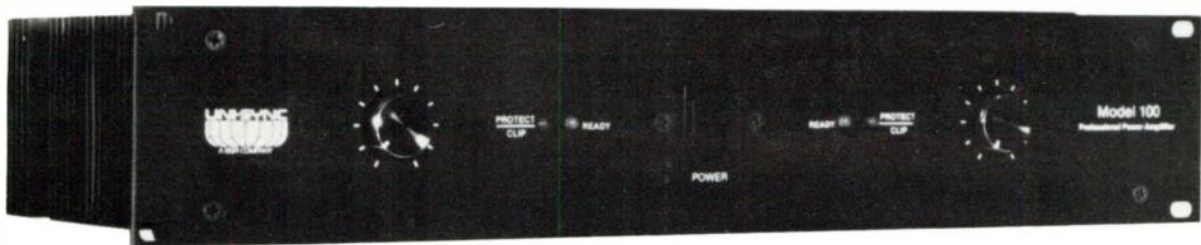
Get your band on the wagon. All around the world — night after night, gig after gig — you'll find Yamaha mixing consoles the choice of more and more professionals. People who don't regard professional quality as a luxury, but as a necessity. Your Yamaha pro sound dealer can give you all the reasons why you should join them.  **YAMAHA**

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CONTENTS

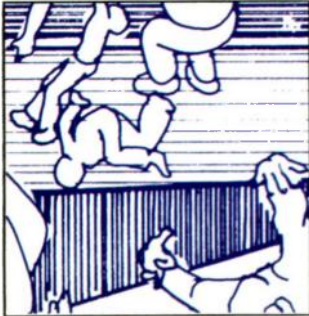
THE FEATURES

26

**COMMERCIAL/PERMANENT
 SOUND REINFORCEMENT:
 AN OVERVIEW**

*By Larry Musci and
 Robert T. Davis*

Altel's and Altec's experts 'spill' some of what they know about this serious business called "commercial sound."



32

**COLLECTOR'S ITEM:
 RICK NIELSEN, OF 'CHEAP
 TRICK', AND HIS GUITARS**

By Steve Caraway

A fine guitarist and his collection of fine guitars! A look at Rick's vintage instruments.

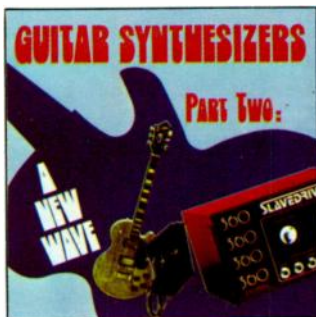


34

**GUITAR SYNTHESIZERS—
 A NEW WAVE—PART 2**

*By Willie Avant and
 Bob Easton*

The man behind Ampeg's Patch 2000, and 360 Systems' main man discuss their instruments and their applications.



42

**K.I.S.S. or KEEP IT SIMPLE
 STUPID!**

By Bob Hoffman

ARP's vice president of marketing on selling and qualifying synthesizer, or musical instrument, customers.



THE STAPLES

EDITOR'S LETTER

6

FORUM

Sound Arts' Open Communication Line

8

TERMS

By Bob Heil, Mike Beigel, Larry Blakely

A Continuing Industry Glossary Of Commonly Used Audio-Oriented Terms With Their Definitions Angled Toward Today's Dealer

9

COMMON CONSUMER QUESTIONS

Dealer's Most Asked Questions Answered By "Those In The Know—In The Field."

12

TROUBLESHOOTER'S BULLETIN

Courtesy of JBL

Easy Troubleshooting Tips That Will Relay To The Dealer Those Troubleshooting Items Not Readily Realized Or Understood By The Outlet's Staff.

14

SO YOU WANT TO KNOW: SIGNAL CHAIN

By Craig Anderton

A Primer On The Subject of 'Sophisticated Audio' By This Noted West Coast Author.

18

SOUND SHOPPE

By Charlie Lawing/Memphis Strings and Things

Memphis Strings and Things' Own Covers The New 'Goodies On The Shelf' for *Sound Arts*.

22

DEALER DOSSIER

By Steve Caraway

A look at Chuck Levin's Washington Music Center

44

INDUSTRY UPDATE

The Latest 'Poop' From Our Business Community

48

ADVERTISER'S INDEX

50

COMING NEXT ISSUE!

Noise Reduction

What Makes A Good Rep?

Feedback: The Consumer's Headache

A Look At Synthesized Percussion

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 Coffeen, Anderson and Associates

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Washington, N.Y. 11050. Unsolicited manuscripts
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panied by return postage.

A LETTER FROM THE EDITOR

Well, here we are into the third issue of *Sound Arts Merchandising Journal* and I suppose you'd all like to know how everything is going to date. The response to the first issue was quite favorable [see "Forum" in the last issue for a sample of the "Yea *Sound Arts*" letters]. Every single copy of the first issue that was shipped for debut at the West Coast NAMM Exhibit, was distributed. I came home with only four copies myself, and those went to my mother! The words and help from our friends in the industry have been abundant, while the number of subscription and dealer qualification cards mailed into our Port Washington offices is ever increasing. In short, a successful introduction for a magazine that will probably be read by everyone in this industry within the next couple of years.

There is only one area in which the response has *not* been so remarkable and that is *dealer input*. Again, this is a magazine designed for you and your business needs (Mr. Dealer) and we want to know—what you want to know. Send us your ideas on useful editorial, what would benefit your staff? How about some "Common Consumer Questions" for our column and our readers? *Communicate*—that's the main thrust of this publication. Sure, we *could* put out a book without your input, but how valid would that be? How representative is that idea?

For those of you who have been in communication with us, thanks. We really do appreciate your knowledge and suggestions. For those of you who want to write, but haven't—get off you duff and drop us a line. I love to see large stacks of mail on my desk when I come in the office, and your letter should be there!

* * *

There are a few new names in this issue so I thought I would identify our new participants. First off Fred Ridder is no longer co-writing our "Terms" column, due to his hectic schedule at New York's Record Plant. We welcome Mike Beigel, technical consultant with Musitronics, who is now giving us his words in that section of *Sound Arts*. Another change in the same column, but in the "Recording" area, is the contribution of dbx's Larry Blakely. Larry takes over for Michael Tapes, whose main function in time is running Sound Workshop. I would also like to say "hey" to Craig Anderton, an old associate of mine at Guitar Player Magazine. Craig will be writing "So You Want To Know," a column designed to be a primer in the broad and wide-open subject area of "Audio." Craig, in his own unique entertaining and informative style, will offer introductions into the various subject areas concerning audio and its tools and theories. If you look at this month's "Sound Shoppe" you'll see that Charlie Lawing, co-owner of Memphis Strings and Things (see February 1978 *Sound Arts*), is now handling the new product section. The format has changed a bit, offering the dealer practical consumer applications and suggestions for the new products introduced every month.

There you have it—ideas and constructive changes. That's what *Sound Arts* is, in addition to education and information.

Appreciation,


Steve Caraway

HUSH UP YOUR 4-TRACK.



Introducing dbx professional four-track
tape noise reduction for under \$500.

You've just settled on a TEAC, Tascam, Otari or Dokorder four-track tape deck for that studio you always wanted to have. You've chosen the mikes, the carpenter is almost finished (or maybe you even built it yourself). Your console's ready to be wired into place.

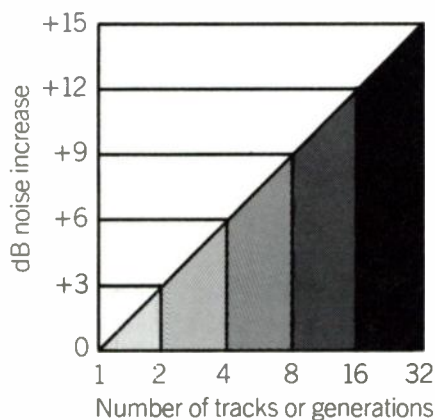
But...haven't you forgotten just one important item?

Noise reduction.

Because every time you (or your group) want to bounce a track, you're adding at least three dB of tape noise (see chart). So the great artistic result you plan to end up with, might end up sounding like a rainstorm.

Fear not. Help is at hand. It's the new dbx 155 four-channel tape noise reduction system. You can add it for far less money than you ever imagined possible. Here, on one compact chassis, is a complete dbx noise reduction

Additive Noise Chart



system. But the best part is, it will give your tape deck an extra 10 dB of headroom, and reduce tape noise by 30 dB. That means no audible noise whatsoever will be added to your tracks. And, because dbx tape noise reduction operates by linear compression/expansion, you

won't have to get involved with tedious level calibration, either.

All you need do is press the playback buttons to hear noise-free, full dynamic range reproduction of your music.

The new dbx 155 also has user-changeable modular circuit boards, so in the unlikely event that one processor fails, the other channels remain operational. You can even keep a spare on hand.

Visit your dbx professional dealer now, for a demonstration of our new 155 tape noise reduction system. Discover how you can put an end to tape hiss, without putting an end to your bankroll.

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FORUM

"Forum" is an open communication line for you—and we want your input. Any questions, problems, opinions—whatever! Send it along for consideration to: Sound Arts, c/o Forum, 14 Vanderventer Ave., Port Washington, NY 11050.

* * *

Having just encountered my first edition of SOUND ARTS, I was pleasantly pleased to see your use of people prominent in the industry to answer readers' questions.

Having developed a sound seminar course of instruction which I have personally given to over a hundred people, I feel well capable of effectively answering questions relating to sound and acoustics.

Most importantly in answering a question, the teacher must look to see what it is that the questioner does not understand. Clearing up this understanding usually allows one to answer the question for himself. In addition, people like Tom Walters are often prone (as was I in the beginning) to effect an answer on quite a different level from that upon which the question was asked. I doubt that a person who had to ask the question "What is Sound Pressure Level?" would be prepared to deal with 101,300 newtons per square meter equals 194 dB SPL. For your perusal, my reply to that question follows.

If you would like to try me on some of these, please feel free.

William Peterson

"What is Sound Pressure Level?"

The motion of waves in the air which we perceive as sound is analogous to the motion of waves in a pond when we cast in a stone. The larger the stone, the greater will be the height, or amplitude, of the undulations. Likewise, the louder the sound generator, the greater will be the level of the sound as we perceive it.

The first person to do any well documented research into the nature of sound and hearing was Alexander Graham Bell, and our basic unit of measure was named after him. One "Bel" refers to the change in intensity

necessary to cause a sound to be heard as being twice as loud. As the ear can detect changes as small or smaller than one tenth that amount, we normally use the term "decibel" to measure sound pressure levels. As a frame of reference, we have established the absolute barest threshold of hearing as being 0 dB SPL—where the loudest sound we can tolerate before exceeding the threshold of pain is in the neighborhood of 140 dB SPL. Levels in excess of 130 to 140 dB can cause permanent hearing damage in some people, and modern high power sound reinforcement systems can produce close to these levels at close range. Persons who continually subject themselves to levels in the range of 115 dB and higher while young, will likely pay the price in later years with hearing difficulties due to high frequency loss. The governments' Occupational Safety and Health Act (OSHA) has set up criteria for limits of exposure to different levels of sound, with the lower sound pressure levels being able to be tolerated for longer periods of time without apparent damage. In Britain, the government has gone so far as to limit the maximum SPL in discos, and live concerts. Let us hope we can protect ourselves such that our government won't feel the need to do the same.

I have just received the premier issue of SOUND ARTS and have gone through it very carefully. It is an attractive publication, and graphically certainly far above average. We wish you success with it. It is obvious from going through the publication that a lot of time and effort went into its preparation. Good luck with your new book.

Lawrence LeKashman
Electro-Voice

We are very impressed with the first issue, it looks like just what the industry needs about now.

Peter Horsman
JBL



TERMS:

A CONTINUING INDUSTRY GLOSSARY

RECORDING

By Larry Blakely

When discussing recording equipment, there are many terms or words that might appear to the newcomer to be just plain "Greek". When one hears of terms used in recording and wishes to know the definition, you can usually turn to an electronics handbook or one of the few available handbooks on the recording process. Upon locating definitions to these terms, they are usually interspersed with mathematics, graphs and other new words and the reader ends up more confused than he was in the beginning. I have spent 20 years in most every aspect of the recording and audio electronics industry and these terms have become a second language to me. I will attempt in this column to outline the most commonly used terms and boil them down to simple plain English so that the reader may begin to develop a better understanding and a basic recording vocabulary.

We will start with the front end of the recording process. The music or sound is picked up by a *microphone* of which there are a number of associated terms and categories. Microphones pick up sound waves with a diaphragm that vibrates when the sound waves are superimposed on it. As this diaphragm is vibrated by the sound, it needs some form of converting process on the back side of the diaphragm to change this acoustical energy into electrical energy. There are several basic types of microphones.

Dynamic: Behind the diaphragm is a small electro-magnetic pick-up assembly that converts the vibration of the diaphragm into electrical energy. This type of microphone is often used for high quality recording.

Condensor: This microphone has a double diaphragm, one that vibrates while another diaphragm behind it remains stationary. These two pieces of metal coated mylar form an electric condenser. This element is charged by

ELECTRONIC MUSICAL INSTRUMENTS & ACCESSORIES

By Mike Beigel

Reverberation: The acoustic effect of the result of sound reflections from the interior surfaces of an enclosed space. When a sound radiates from any source in the room, it travels in all directions, losing its intensity as it travels. Upon hitting a wall or other reflective surface, the sound wave bounces off and travels in another direction. Even with the simplest sound sources, the large number of reflections and their complex nature will create a diffusion or coloration of the sound. Also, the continuing recirculation of the reflected sound around the room results in the persistence of the sound for a time after the sound source has stopped radiating. The combination of these acoustical effects is known as reverberation.

Reverberation Time: The amount of elapsed time during which a reverberant sound can be heard after the sound source has stopped radiating. Officially, this means the time taken for the reverberant sound to decay 60dB from its original sound level. The room characteristics which effect reverberation time are many, room size and shape, reflectivity of walls and other surfaces, number of people in a room, and special sound absorbing or reflecting fixtures are among them.

Artificial Reverberation: In recording studios it is often desirable to record only the direct sound sources and then add reverberation later. By recording in an acoustically "dead" or completely absorbant room, the direct sound is obtained, then, a desired amount and quality of reverberation is added, or mixed, into the original sound. This artificial reverberation can be derived many ways—among them acoustically, electro-mechanically, and purely electronically.

Reverberation Chamber: An electro-acoustic means of generating artificial reverberation. A room is sealed from all outside sound, and equipped with

SOUND REINFORCEMENT

By Bob Heil

Amplifier, Power: An amplifier which drives a utilization device such as a loudspeaker.

Amplify: To strengthen a given electrical signal by increasing its amplitude, or raising its level. The opposite of attenuate.

Attenuation: A decrease in signal magnitude from one point to another, or the process causing this decrease.

Balanced: In communication practice, the term usually signifies:

1. Electrically alike and symmetrical with respect to a common reference point, usually ground.

2. Arranged to provide conjugacy between certain sets of terminals.

Compressor: A transducer which, for a given input amplitude range, produces a smaller output range.

Filter, Band-Pass: A filter having a single transmission band, neither of the cutoff frequencies being zero or infinite.

Filter, High-Pass: A filter which has a single transmission band, extending from some cutoff frequency, not zero, up to infinite frequency.

Filter, Low-Pass: A filter having a single transmission band extending from zero to some cutoff frequency, not infinite.

Filter, Sound Effects: A filter used to adjust the frequency response of a system for the purpose of achieving special aural effects.

Frequency Response: A term closely related to, but more specific than *Frequency Range* (defined in last month's *Sound Arts*). Calls for output versus frequency data over specified frequency range, usually in the form of a chart for transducers like microphones and speakers. Most commonly expressed for tape recorders as given in the example for *Flat Response* (see March 1978 *Sound Arts*).

Gain Control: A device for adjusting the gain of a system or transducer.

Gauss: A measure of flux intensity,

TERMS: (CONTINUED)

A CONTINUING INDUSTRY GLOSSARY

RECORDING

special electronics contained in the microphone. When the moving diaphragm of his microphone vibrates, the acoustical sounds are changed to electrical energy with its built in electronics. Earlier condenser microphones required an external power supply which is the part of the microphone system that supplies the proper voltages to the microphone electronics that are contained within the microphone. Subsequent condenser microphones, provide a place for batteries inside the microphone that supply the voltages to the built-in electronics. Other newer types of condenser microphones are actually powered with voltage fed from the recording console through the actual audio cable. These are called "phantom-powered" condenser microphones and thus do not require loose external power supplies or internal batteries.

Electret Condenser: This microphone is a condenser microphone but which tends to be less expensive; however, the quality of these microphones is generally very good. These microphones have permanently charged condenser elements that require less complex electronics. Usually the higher quality electret microphones run from a battery which fits inside the microphone or cable.

There are other types of microphones that are normally not considered high enough quality to use for recording.

Ceramic: These microphones use a ceramic element to create the electrical voltage.

Microphones used in today's recording are the dynamic, condenser, and electret and occasionally we find the ribbon microphones used.

In next month's column I will discuss what sounds are available from the different types of microphones and the pick-up patterns of the various microphones.

ELECTRONIC MUSICAL INSTRUMENTS & ACCESSORIES

very reflective wall surfaces. A speaker in the room generates the sound that is to be reverberated. Then, one or a number of microphones, also in the room, pickup the reverberated sound for further processing. This method has advantages of natural sounding reverberation and variability through changes in room absorption and microphone placement. The disadvantages are its large size, non-portability, and the need for extreme acoustic isolation.

Reverberation Spring: The simplest and cheapest form of electro-mechanical reverb system. It consists of a driver-transducer connected to a coiled spring, which is connected to a receiver-transducer and preamp. The driver-transducer "shakes" the spring with the signal to be processed. The spring moves the signal down to the receiving transducer and also sets up reflections of the signal back and forth on itself, which simulate the reverberant sound. Disadvantages include a metallic, or one dimensional, type of reverb effect and sensitivity to external mechanical noise and shocks. Some spring-reverb systems use a number of different length springs and different transducers to create a more realistic effect.

Reverberation Plate: A more advanced electro-mechanical reverb system. Instead of using a coiled spring, this system uses a two dimensional plate. A driver-transducer and one or more receiver-transducers, located on the plate, operate in a manner exactly like the reverb spring. Often a mechanical "damping" system allows a variable amount of reverb time and intensity. This system is much more expensive than the spring system, but offers enhanced realism since the sound waves have many more reflective paths than in the spring. Still the system is vulnerable to outside noise and shock, and is usually not very portable.

SOUND REINFORCEMENT

numerically equivalent to flux lines or maxwells per square centimeter.

Harmonic Distortion: Distortion characterized by the appearance in the output of harmonics of the fundamental frequency when the input wave is sinusoidal. Usually expressed in percent, numerically equal to one hundred times the ratio of the root-mean-square voltages of each of the individual harmonic frequencies, to the root-mean-square voltage of the fundamental.

Harmonics: Overtones which are integral multiples of the fundamental frequency.

Hertz (abbreviated Hz): A unit measuring frequency and equal to one cycle per second.

Hiss: Audio frequency noise having subjective characteristics analogous to prolonged sibilant sounds.

Impedance Loads: The impedance presented by the load.

Impedance: The resistance to the flow of alternating current in an electrical circuit, generally categorized as either high or low, but sometimes given in ohms or millions of ohms (megohms). Commonly used to characterize the input or output termination of components so that proper match can be made when interconnecting two or more devices.

Input Signal: The electrical voltage presented to the input of an amplifier, head, or other electronic component.

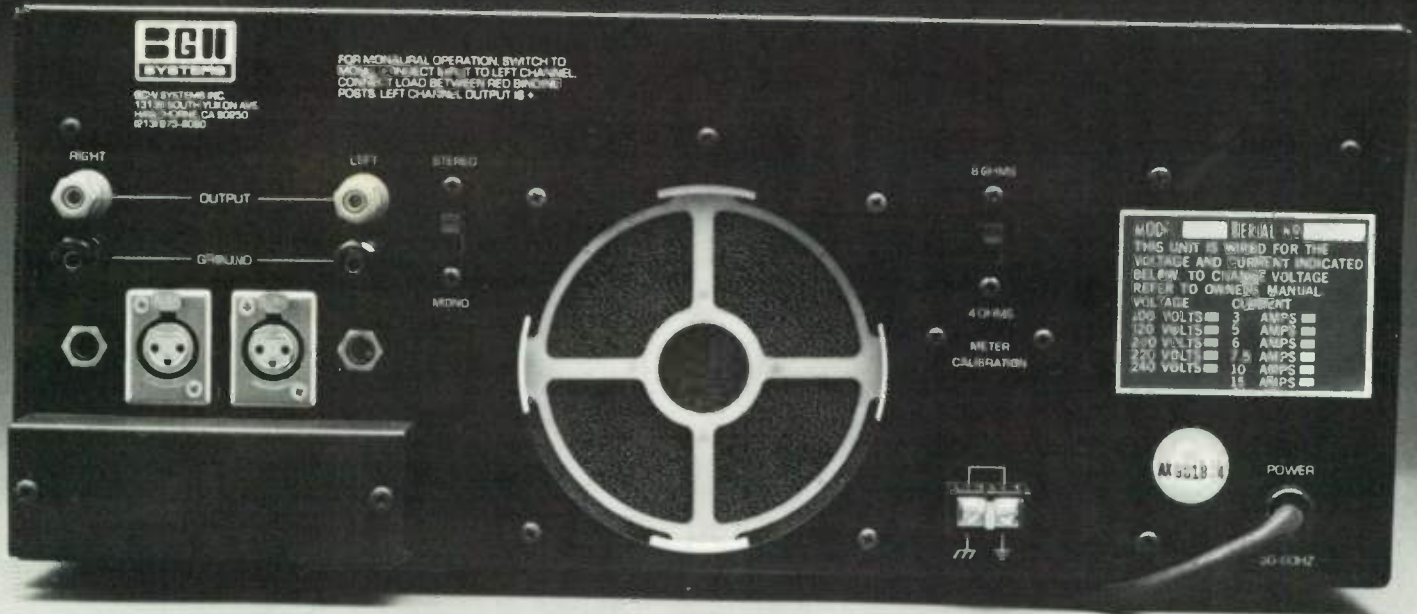
Intermodulation Distortion: Distortion which results when two or more pure tones are nonlinearly combined to produce new tones with frequencies representing the sums and differences of the original tones and their harmonics.

KHz: Abbreviation for thousands of cycles per second.

Load: 1. A device which receives power.

2. The power delivered to such a device.

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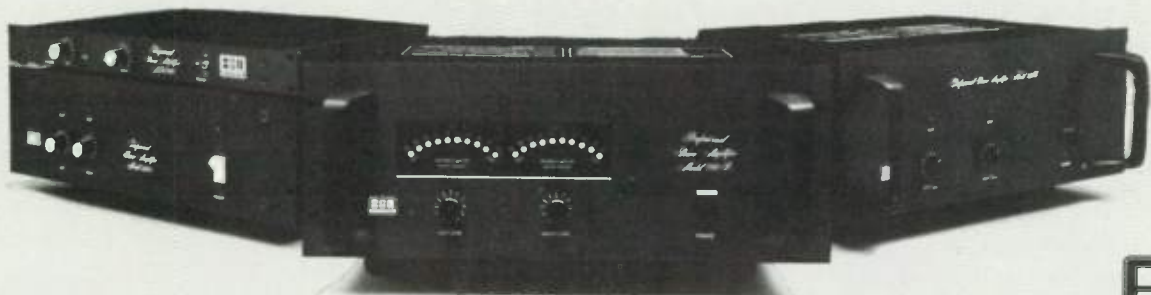
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International Inquiries please contact the factory.



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What is signal-to-noise ratio?

Definition-wise, it is a ratio of the signal out of the unit versus what you get out of the unit when there isn't any signal. That's a ratio, then you take a logarithm and then it's expressed in dB (usually -dB for the amount of noise below the signal you'd have coming out). So much for the definition, it gets a little sticky here because if you are reading spec sheets, getting into the 'real life world' as it were, you can get *different* signal-to-noise ratios. Usually when you turn the volume control up and down you can get different amounts of 'noise' out of the unit. You can sometimes read a residual amount of hum and noise spec, when it's below some reference point, say 0 dB. If you can do *that*, all you have to do is put in a larger signal and turn down the volume control and read your "noise." Of course it's going to be lower so you have a *larger* signal-to-noise ratio that way. That is why this particular term is so ambiguous, because unless they spell out on a spec sheet what they did, it doesn't really mean *anything*. Given a 'real life' situation what amount of -dB can you hear? How noisy is a -67dB signal-to-noise ratio? Those are the main ramifications of the whole thing. It gets back to when you have level controls involved, where do you set them when you take this measurement. Signal-to-noise ratios can vary over such a gargantuan range, just due to testing procedures. Probably a better spec is what is called *equivilant input noise*. This spec varies a little bit too but not as much. Essentially it's the same thing as signal-to-noise ratio only instead of just expressing the noise measurement below your output level, you add to that figure the gain of the amp, which is in dB, then you come out with an equivilant input noise. You have something a little bit more reliable, because the unit isn't going to change too much (maybe a + or - 6 dB) with

different gain settings. But if you pull down the volume control and it gets quieter, you also are reducing the gain, so the final number still comes out about the same point.

Clem Michel

Uni-Sync

Westlake Village, Calif.

What is line splitting and what does it accomplish?

In regards to a microphone snake, you'd have 24 inputs coming off the stage into a *box*. Now at this point the microphone signal splitting can be done in two ways. One is a *passive* system, which is a series of transformers and the other way is just to parallel off and have 'hard' wire to another connector. This last method of splitting those lines is not the best way to accomplish line splitting because you would end up splitting the gain, on each channel, in half. In other words, if you had a 200 ohm microphone and you split the signal in half you would have only a 100 ohms into each side, and then even less if you go three ways. With the usage of transformers you don't have that loss in each channel, because it's passive. The Uni-Sync people are now making a microphone spliter with faraday-shielded transformers on every input and output and this helps keep the impedance the same throughout the unit. Another way this splitting can be done is the *active* way, but this is noisier unless it's done well, besides it costs about twice what passive costs. Now, what line splitting accomplishes can be best explained with an example. Say you have a total of 24 inputs coming off the stage into a splitter box. The signals can then be sent in three or four different directions. One signal can go out to the guy in the audience at the main-mix console, another can go to the guy on the side of the stage mixing the monitors, then there would be one or two signals open. You may at this point want a stereo monitor mix,

which would take care of one signal and the remaining signal could go to a remote recording truck. Each signal sent out is an individual signal, so if the main mix man pads down on something, it won't effect the other signal's flow.

Jim Mathews

Leo's Music

Oakland, Calif.

What is bi-amping and what are the benefits of using a bi-amped system?

To set a format for the question, we are talking in terms of *audio* and what we are looking for is reproducing something pleasing to the human ear. The human ear is capable of hearing approximately 20 cycles to 20,000 cycles, that's low frequency to high frequency. If you bi-amp a sound reinforcement system to reproduce those tones, the advantage of doing that is you can utilize speakers that will produce a portion of that range more efficiently and more cleanly than one speaker would. In other words, if you take one speaker, take a signal and put that through an amp, and put it into that *one* speaker, it will have a particular fidelity. If you have a bass speaker that reproduces low frequencies well and a high frequency speaker that handles highs very well, then take that *same* signal and split it into low signals and high signals and put them through two different amplifiers to power those two different specifically designed speakers, you increase your sound quality. Each different component can handle each frequency more *efficiently*. At Showco we handle that idea by splitting our signals four ways, so all of our speaker systems are four-way systems. We've taken that theory on bi-amping and expanded it somewhat. Professionally, you would find that most systems are bi-amped, tri-amped, or four-way.

B.J. Schiller

Showco

Dallas, Tex.



If all we did was build great sound systems, we'd be in trouble.

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Incidentally, we do build great sound systems.

At Altec Lansing, we manufacture a full line of top quality, portable sound reinforcement speaker systems, each designed to meet the tough and demanding requirements of professional and semi-pro musicians. Roadworthy. Reliable. Ask the pros. Ask our competitors. They'll tell you Altec Lansing is a name to be respected.

What can Altec Lansing offer you? The best. National advertising support, sales promotion, excellent delivery, a complete dealer financing program, a new sales organization sensitive to your needs, top quality products, and a reputation as good as our clean, clear sound. We won't brag. We'll just let our products and programs speak for themselves.

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Altec Lansing International, 1515 South Manchester Avenue, Anaheim, Calif. 92803



CIRCLE 93 ON READER SERVICE CARD



TROUBLESHOOTERS' BULLETIN

Courtesy of JBL

Too Little Amplifier Power Can Produce Too Much

1

We occasionally hear of JBL owners who damage the high frequency components of their loudspeaker systems using amplifiers that are rated at less—rather than more—power output than recommended. Understandably, they often find it difficult to comprehend how such an amplifier can actually burn out JBL components when they have been told, by our dealers and in our literature, that JBL loudspeakers can handle large amounts of power and will also deliver big sound with relatively little input power. These statements are true, provided the amplifier is not overdriven. To understand this more clearly, it is necessary to understand the nature of music as it relates to amplifier power and distortion.

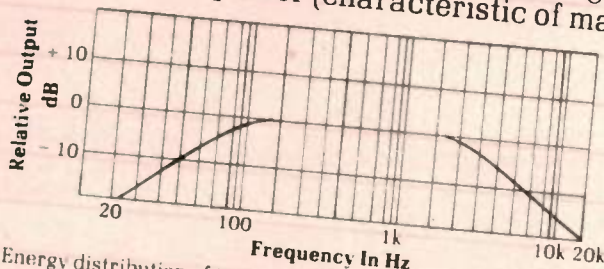
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First, The Nature Of Music

Not all musical notes are created equal. There is much more power in the lower registers of music than in the midrange and treble regions. If we examine the accompanying graph, we can see that the energy content of treble frequencies is typically 10 to 20 dB less than bass and midrange frequencies. Therefore, even if we allow for 10-dB peaks in high frequency program material, which is common, the high frequency driver of a system will be called upon to handle only about one-tenth the power that the low and mid frequency components must sustain. This natural distribution of musical energy works to

3

our advantage. It means, for example, that a loudspeaker system capable of handling 100 watts should have a high frequency unit capable of handling 10 watts. Thus, if the high frequency unit is designed to handle 20 watts of power (characteristic of many JBL



Energy distribution of typical recorded orchestral music. Rock and electronic music follow the same general contour.

4

systems), we are building a 100% safety factor into the high frequency unit. The result is that the capabilities of the components of a loudspeaker system parallel the natural energy distribution of music.

Now, Let's Look At The Nature Of Amplifier Power

The power output specification of an amplifier is not absolute. Under certain operating conditions, such as when the volume control is set too high or when the input signal is too great, the amplifier can exceed its published output. The power output of an amplifier is rated with reference to a given level of total harmonic distortion (THD). If required to produce more power, the amplifier will do so, but at considerably greater distortion levels. For example, an amplifier rated at 10 watts (20 to 20,000 Hz into an 8-ohm load) at no more

5

than 0.5% THD could be overdriven to produce 20 watts of output power to the loudspeakers. Under these same adverse conditions, an amplifier rated at 20 watts could deliver 40 watts to the loudspeakers; a 35-watt amplifier could deliver 70 watts and a 50-watt amplifier could be overdriven to deliver 100 watts. This distorted output could very well be in the treble region, as we shall soon see.

Here's The Killer: Distortion Generally Affects High Frequency Drivers

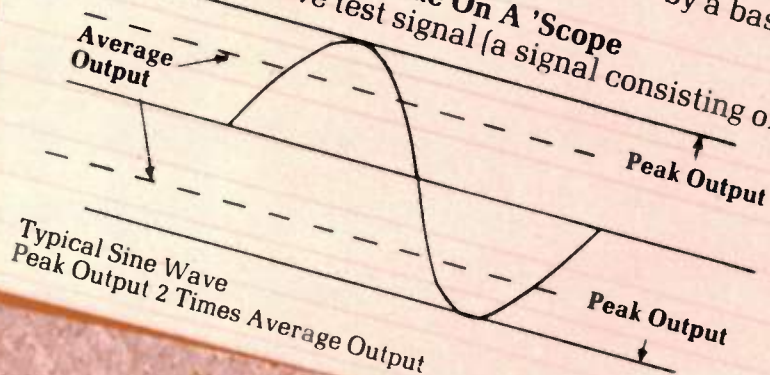
The additional power generated by overdriving the amplifier is rich in harmonics (distortion). These harmonics can be particularly dangerous to high frequency drivers. Harmonics are higher frequency multiples of the original signal; therefore, the high

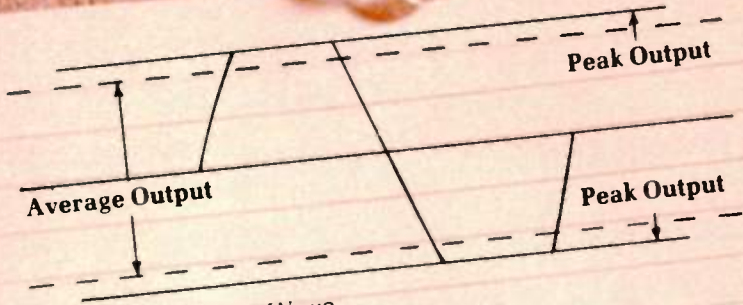
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frequency component of a loudspeaker system must bear the brunt of the distortion—even though the original signal may have been generated by a bass guitar.

Here's What It Looks Like On A 'Scope

When a sine wave test signal (a signal consisting of a

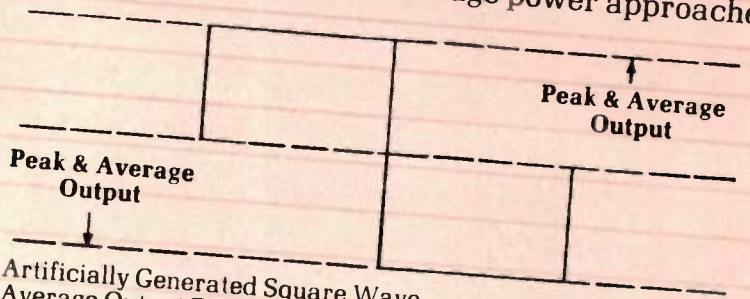




Typical Clipped Sine Wave
Average Output Approaches Peak Output

fundamental frequency without overtones or harmonics) is displayed on the screen of an oscilloscope, its top and bottom extremes will exhibit normally rounded contours. Average output power is one-half the peak output power. When an amplifier is

overdriven, the contours are "clipped" off, producing a near square wave, having flat areas at the top and bottom limits, in which the average power approaches



Artificially Generated Square Wave
Average Output Equals Peak Output

the peak power. When this occurs, up to twice the amplifier's rated output can be delivered to the high frequency driver, which may not be capable of handling the abnormal load. A higher powered amplifier, however, can generate the required power levels without clipping, allowing the loudspeaker system to receive program material containing a normal distribution of energy levels. Under these conditions, damage to the high frequency driver is most unlikely.

What Can The User Do?
There are no hard and fast rules. Very few amplifiers have meters that are capable of accurately indicating

when an amplifier is being overdriven to the point that it could damage loudspeakers. Even the volume control position is not a clue—half rotation often produces considerably more or less than 50% of an amplifier's power. There are no absolutes. We wish there were.

However, we can offer a few guidelines:

1. Purchase an amplifier that will provide more power than you will need. Remember, a loudspeaker can require up to ten times the average power known as transients. If the amplifier has enough reserve power, transients will be clear and crisp. If not, the transients will be muddy or dull. When an amplifier runs out of

undistorted power, it is forced to exceed its design capabilities, producing dangerous power levels rich in high frequency distortion.

2. Do not drive the amplifier into clipping. Clipping sounds something like a stylus mistracking, and generally occurs on loud passages when the system is played at loud volume levels. If clipping occurs regularly, turn down the volume level or install a larger amplifier that can deliver the required power without distortion.

3. Do not make or break connections to the amplifier while it is operating. Unplugging or inserting connectors into an amplifier, preamplifier or receiver while it is operating can produce momentary loud

11

buzzes. Often, these buzzes occur at high power and can destroy loudspeaker voice coils very quickly.

4. Practice audio precaution. If your tape deck does not have tape lifters, it can produce squeals when in the fast-wind mode (either forward or backward) that can destroy high frequency drivers. Turning the volume down when fast-winding is a simple remedy. Do not play the system loudly with excessive bass boost, which can easily cause the amplifier to be overdriven. Remember, a 3-dB increase in volume is just noticeable to the ear, but requires double the amplifier power, and many tone controls are capable of providing boost of 15 dB.

12

Summary
JBL loudspeaker systems are efficient; they will produce reasonable volume levels in a room of moderate size with very little amplifier power. However, if a small amplifier must be overdriven to obtain the desired volume levels in a listening room, thus generating high power and distortion levels, the user would be better advised to purchase a larger amplifier capable of producing the required power with negligible distortion. In any case, an amplifier should be selected with an output power rating that is greater than the maximum power that will be used. This margin of reserve power will ensure that the amplifier will not attempt to deliver more power than its design allows. The net result will be distortion-free sound reproduction and virtually unlimited loudspeaker life.

13

BY CRAIG ANDERTON

Before we get into this month's topic, I'd like to welcome all of you to this column. We will be discussing basic audio and musical concepts, and hardware, in the hopes of "demystifying" the many aspects of these subjects. Changes in electronics and music technology have been so numerous, so fast-paced, and so seemingly complex, that many people are just plain lost in a sea of strange terms and sometimes even stranger equipment. But have hope! It's not all that hard to learn about these new toys, and I'm going to be doing my best to make it as painless as possible for you. If you have any particular topics you'd like to see covered in this column, write to me *c/o Sound Arts*. While I may not be able to acknowledge every letter, I do take the time to carefully read and consider any comments made by readers. When people furnish feedback, I listen.

So . . . on to basic sound system concepts. In many ways, electronic systems of any kind can be broken down into a series of building blocks; this makes it much easier in terms of discussion, because we can examine each block one at a time rather than having to deal with any given system as a whole.

All sound systems (and I really do mean *all* sound systems, whether we are talking about a \$29.95 guitar amp, a multi-thousand dollar stereo system, or even the megawatt sound reinforcement systems used by major performing groups) have a great deal in common. Figure 1 shows the general outline of building blocks for any given sound system; don't worry if this doesn't seem clear just yet, because our next step is to give an overview of each of these blocks.

Block #1 is the *program source*. This is a fancy term for "whatever-is-going-to-be-making-sounds-we-want-to-hear." In the case of a stereo system, the program source might be a record, or tape, or the program played over an FM station. In the case of a PA system or musical instrument amplifier, it could be the sound coming from a guitar, or a vocalist, or a set of drums. Every sound system exists to either amplify, or reproduce and amplify, something—the program source is the something we want to work with.

Block #2 is called a *transducer*. By way of definition, a transducer converts one form of energy into another. For

our applications, a simple example would be the microphone; it translates air waves into electrical impulses suitable for processing by the rest of the system. In fact, whatever we want to feed into our sound system *must* be converted into electrical energy first . . . another example would be an electric guitar pickup. This is another form of transducer that translates the motion of a guitar string into electrical energy. How about a record? In this case, the transducer is the stylus/cartridge assembly, which converts the little wiggles and grooves on a record into (you guessed it) electrical energy. There are other transducers: tape heads convert the magnetic imprint on tapes into an electrical signal, contact microphones can attach to acoustic instruments and give out an electrical impulse; and so on. These different types of transducers will be covered at some point in future columns. Interestingly enough, transducers are often the weakest link in any sound system, both in terms of efficiency and fidelity. It is very easy, for example, to design a very clean amplifier; it's harder to design a very clean phono cartridge. But we really don't need to pursue this much further for now; let's move along to the next stage in our system.

Block #3 is a preamp/signal conditioner block. In many cases, the outputs of transducers are very weak, or in some other way not suitable for driving the blocks further down along the signal path. Take a microphone output: the microphone generates extremely feeble voltages that are difficult to work with directly. In order to make them easier to work with, we can boost the level with a pre-amplifier. The pre-amplifier is a special kind of amplifier; it usually is optimized for lots of gain (to boost the signals) consistent with the lowest possible amount of noise and distortion. We'll be having a column devoted to the concept of pre-amplification, so we won't go into the subject too deeply at this time. You may think of the transducer/preamp combination as a pair, since they often work together very closely; between the two of them, they take your program material (whether vocalist's voice or phonograph's grooves) and turn it into a form suitable for subsequent amplification.

Block #4 is optional. This is the block where changes occur to your signal; a good example of this would be the tone controls on hi-fi rigs, which



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The 4315: An ultra-shallow 4-way, for maximum sound in minimum space. \$783.

JBL studio monitors come in three other models, too. All fully compatible for accurate cross referencing.



JBL

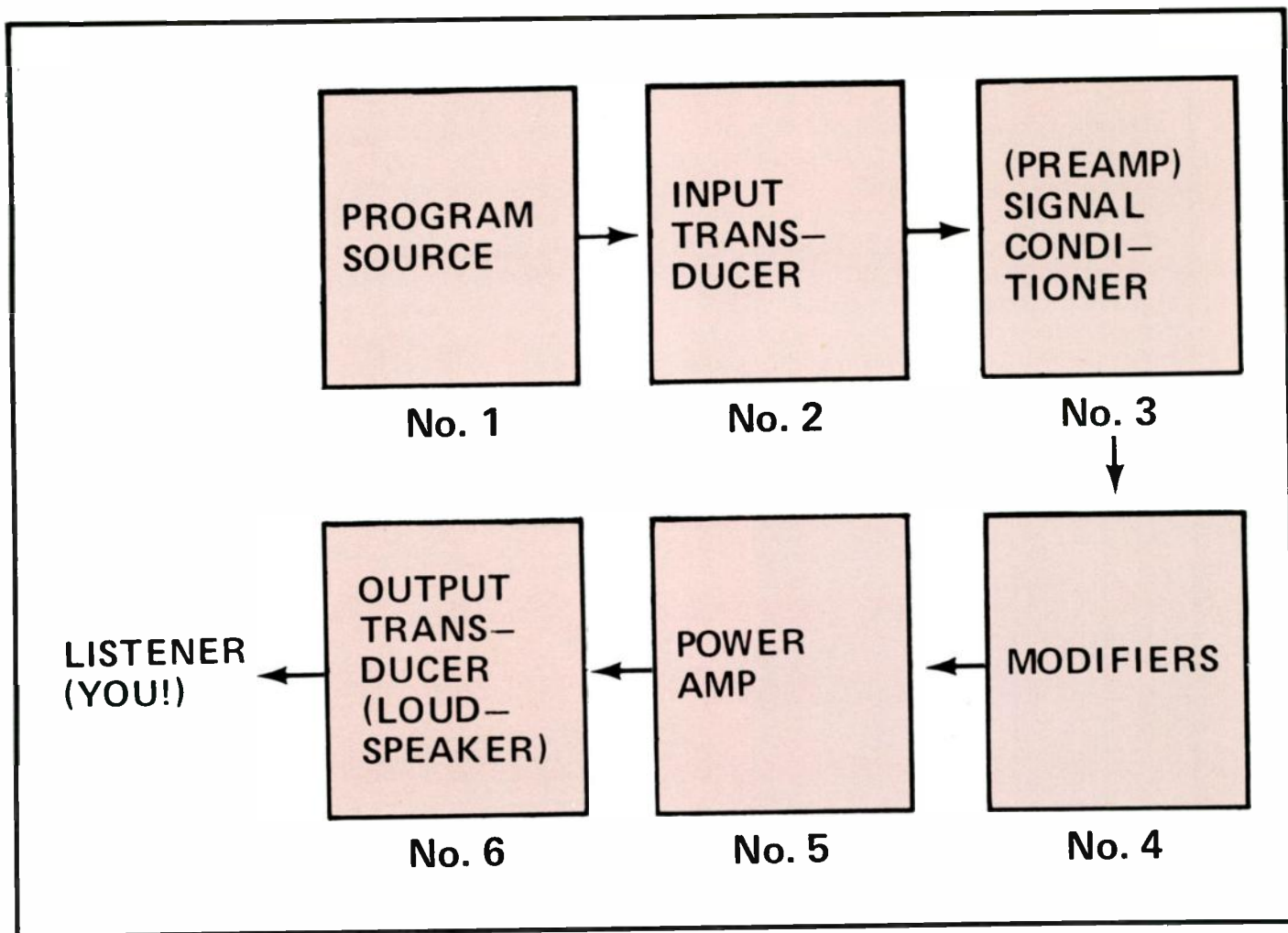
GET IT ALL.



James B. Lansing Sound, Inc. / Professional Division, 8500 Balboa Boulevard, Northridge, California 91329

CIRCLE 87 ON READER SERVICE CARD

WRB



can add extra brightness, bass response, or whatever. Modifiers do not only exist to allow for individual likes and dislikes in terms of tonal quality; sometimes they are very necessary. Example: some contact microphones do not deliver a consistent electrical signal, but instead weight the response towards, perhaps, the bass or treble end, giving an artificial or inaccurate response. If the response is too bassy, then we can use a modifier that removes some of the bass. If the response lacks bass, on the other hand, we can use a modifier that boosts the bass.

Guitar players in particular use a variety of modifiers in their playing; devices like wah-wah pedals, phase shifters, and the like all serve to modify the normal output coming out of a guitar.

Block #5 is a power amp. This is the last step before we hit the speaker. Unlike the preamp, which is meant to amplify delicate little signals, the power amp is designed to amplify relatively high level signals while simultaneously being able to deliver large amounts of power to the speaker.

You see, speakers require lots of power in order to move their little paper cones back and forth, so, power amps are optimized to deliver lots and lots of power. This is why you'll rarely see power amps under 10 watts or so, and sometimes they will go up to hundreds of watts.

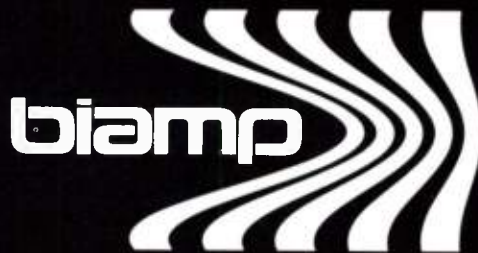
Block #6 is the output transducer, which in the case of a sound system is usually the loudspeaker. The reason why we call this device a transducer is because, again, its function is to convert one form of energy to another. Unlike the first transducer we talked about, though, this one accomplishes the reverse function: it turns electrical energy into mechanical energy. In this case, the power amp delivers a powerful electrical signal to the coil of the speaker; thanks to the physics of magnetic interaction, this electrical signal moves the paper cone of the speaker back and forth, producing sound waves which impinge on our ears and which we hear as *sound*. Like input transducers, speakers are a weak link in any given system, since they are by nature quite inefficient and also quite prone to distortion and other

problems associated with mechanical devices (friction, gravity, and so forth).

So, there you have a basic signal flow applicable to a variety of differing sound systems. There are many other aspects of the signal chain which we need to go over, such as signal-to-noise ratio, flat frequency responses, distortion, and similar limitations that are a part of any system. We also need to examine some of the blocks more closely (in particular the modifiers, since much confusion surrounds these devices). We also need to understand that there are variations on these themes; for example, a PA system might include a mixing stage to combine the signals from several transducers into a unified, blended sound. This may look like a lot of cover, and it is; but by taking things one step at a time, hopefully it will all become clear. See you next month with the story on frequency response—what it is, how we change it, and how to interpret spec sheets that give frequency response information.

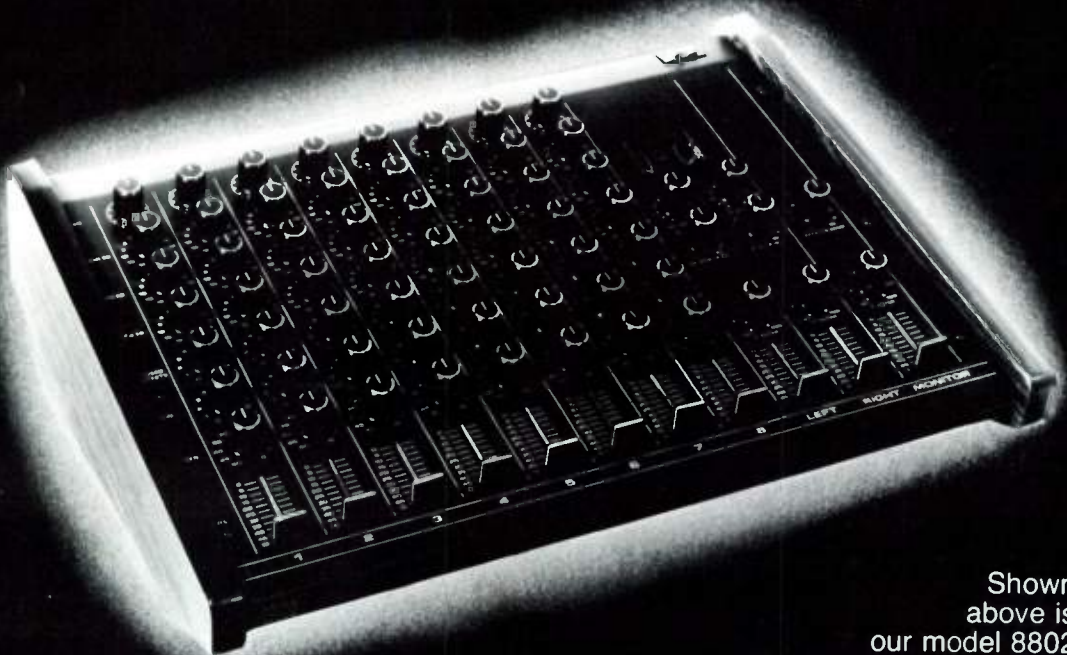


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INTRODUCES

BI-FET TECHNOLOGY



Shown above is our model 8802 8-channel stereo-output mixing console. We also make 6 and 12 channel models. All BIAMP consoles feature BI-FET technology.

WATCH THE COMPETITION FOLLOW OUR LEAD! BELIEVE IN BIAMP!

On June 10, 1977 BIAMP introduced revolutionary circuitry to the professional audio industry at the NAMM Show in Atlanta, Ga. What this means to you is quieter mixers, faster slewing rates, lower distortion, greater bandwidth and improved output capability. In fact . . . a superior product!

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Name

Address

City

State Zip

The SOUND SH

If you are in Memphis, Tenn. with a broken amp and you seek Strings and Things for help with repairs, you might be confronted by Perry Nelson. Perry's shop will be full of hospitalized equipment and electronic knowledge. Some of this knowledge was recently acquired on a trip to the Norlin/LAB Amp Factory in Buffalo, New York. We felt that Perry would be a great help in writing a true evaluation of the new amps, designed and built by Moog. Perry was glad to lend a hand by first describing the extensive equipment used in the building and testing of this new amp series. A room used to test the amps for a period of at least 36 hours under 120 F. degrees temperature at full power, was one thing he first noticed at the factory. Another was a shake table used to test amplifiers under conditions much more jolting than a u-haul trailer.

Perry found their cabinets to be finger jointed, pine with a standard tolex covering protected by steel corners. The sweep tone oscillator tests the cabinets for any rattles, which are impossible since all LAB speakers are fastened securely with eight T-nuts instead of the usual four.

The amp line consists of six models; four guitar and two bass, plus an added attraction for keyboard freaks. The most elaborate factory built keyboard system manufactured (Leave it to Dr. Moog). Both 100 and 200 watt guitar amps have a very good control system for various playing styles. The basic volume, bass, midrange, and treble controls are found on the normal and reverb channels. But, the reverb channel is the best of all. The unit also has a built in parametric equalizer controlled by a knob labeled 'frequency'. By using this feature in conjunction with the midrange control, you can boost or cut a selected frequency for many tone colors.

The master volume used for distortion is the best we've heard on a solid state amp. The knob marked 'multifier' helps to add high harmonics in *simulating* an acoustic guitar but will also

keep the distortion from sounding *solid state*. After all this, you would think, "What more could we want", but nestled to the left of the master volume is a small slide switch wired to route your signal through a built in compressor. This restricts volume at the output stage while you crank the channel open for better sustain at lower volumes. This is great for recording or small clubs where volume is restricted.

All of this can be found on the L-5 (100 watt 2-12" speakers), L-7 (100 watt 4-10" speakers), L-9 (100 watt 1-15" speaker), or the L-11 (200 watt with 4-12" speakers). We really think the



future will bring a 100 watt using the 4-12" speaker configurations.

The bass amplifiers are not so impressive because no one seems to understand the real need of a bass player. The L-2 is a 100 watt with one 15" speaker in a compact, rear loaded enclosure. This would be great for a small club gig. The model L-4 is one 200 watt bass head driving a rather large cabinet for such a simple, straight-forward mounting of the two 15" speakers. When manufacturers realize a bass player needs twice the R.M.S. power of the largest amp in the band, we might see some bass amps worth the bucks.

Last, but not least, is the Synamp designed for keyboards. It is a large cabinet housing two

OPPE

By Charlie Lawing

15" low frequency speakers, a midrange horn, and two compression driven wide dispersion tweeters, all Electro-Voice design. The head is a 400 watt (selectable a 2 x 200 watts for biamping or 2-200 watt full range power amps). Four input channels are equipped with three band parametrics for each channel. A 10 band graphic can help adjust to room acoustics with reverb for those really dead clubs.

Metering, headphone monitor amplifier, and sound kill button for changing synthesizer patches or changing tuning without adjusting input levels, are very handy items needed for complex keyboard rigs. Also provided are two compressors and a clipping indicator light for each power amp. This is all designed and fitted to a very roadworthy case.

After testing the new LAB series amps we had a definite feeling not everyone is just putting an amp and some speakers in a case. Prices of the LAB series are very much in line.

CIRCLE 1 ON READER SERVICE CARD

International Sales Associates of North Hollywood, California have a very nice line for any music store selling electric guitars. Their products, carrying the name Schecter Guitar Research is an easy out for a store lacking a guitar repair or custom shop. The extent of ISA's idea is the design of professional replacement and original guitar parts, ranging from necks and bodies, to screws and switches, just to mention a few. Replacement pickups for Fender instruments can add better tone control and keep that *original* Fender sound. Pickups for Strats, Tele, P-Basses, Jazz Basses, and Tele Basses can be bought alone or in perfect fitting pickguard assemblies made of various metals or brass.

Brass nuts and bridges can be easily attached for more sustain and better tuning, while Schecter bodies can be ordered in various woods such as maple and rosewood. Add an exotic wood body to a maple neck, a pickup assembly,

brass nut, bridge, and some tuning keys and you've got a custom guitar ready to be sold at a price comparable to a new Fender.

Send for a catalog, well worth the dollar it costs and you will be on your way to having a custom guitar display. International Sales Associates, P.O. Box 9783, North Hollywood, California 91609. (213) 782-3202.

CIRCLE 2 ON READER SERVICE CARD

Newly announced from **Intersound** is the Intersound R100F reverb-equalizer which features both a high quality frequency-compensated mechanical delay line and a four band peak and dip (± 20 dB) equalizer. The bisymmetric peak indicator in the reverb drive circuit senses both positive and negative peak levels; a red LED indicates

overload. An input level control allows the R100F to be operated at an optimum level with any input. A fader and a three position switch (pre-EQ, off, post-EQ) are provided for both dry and reverb signals; the separate faders provide control over the relative mix, while the switch allows 9 different signal routing options. The output level control allows the gain to be varied from 0 to +10dB. The R100F will drive a 600 ohm line. Also available is the R100V in which the center frequency of each equalizer is continuously variable over 3 octaves. Typical specs for both units are: less than .01% total harmonic distortion, under -128 dBm EIN, response flat (-1dB at 5Hz and 50 kHz). Suggested retail prices are \$199.00 for the R100F and \$249.00 for the R100V.

CIRCLE 3 ON READER SERVICE CARD

Of the many effects utilizing analog delay IC's, the most popular has been the flanger. By varying a short delay time, the flanger can produce effects ranging from Leslie simulation to jets flying overhead.

A host of these signal processors are available, and more are entering the market place each month. Each new flanger on Strings and Things' display shelves face the inevitable question, "How quiet is it?". Analog circuits generate a fair amount of noise, you see, requiring companders or the like for silent operation. Early flangers sounded like an International Airport at peak hour; while most musicians loved the effects, they found the noise distracting.

Naturally, any new flanger will claim reduced noise. Well, the new **Analog/Digital Flanger** claims to be "studio quiet", a chunk of hyperbole that had both my curiosity and my skepticism aroused. With two months backorder to help build anticipation, I was all ears,



hands, and feet when the box materialized. An eyeball examination produced mixed emotions. The heavy duty cast aluminum box is rugged enough to take most abuse, and features recessed controls, a thoughtful touch, keeping those knobs out of the way of harmful platform shoes. The five control knobs are contoured; the user can "feel" his settings out even in the dark. The AC/DC converter is a draw back; its size prohibits plugging the unit into the convenience outlet of most amps. The Flanger runs on AC alone; a longer, integral AC cord would have

been a better idea than the plug-in converter provided.

These considerations behind me, I pulled out the Schecter Strat, warmed-up the Vibrolux, plugged the Flanger into the wall and got set for a test drive. The folks at A/DA provided me with a sheet of patches for the box; a neat way of getting a user acquainted with the controls and familiar with the sounds possible with the unit. The Flanger has a wide range of effects; a beautiful chorus setting, a rolling phaser, vibrato, or the classic jet-flange, are a few possibilities. A two position selector switch changes harmonic emphasis from even to odd harmonics; this produces a change from a bright-chiming tone, to a deep resonant effect.

The Flanger's noise filtering is accomplished by making the unit voltage-controlled. In other words, as long as a signal of sufficient strength is being sent to the Flanger, the unit is "on" and will flange the signal. Once the volume drops past a set level, the effect *and* the noise drop out, leaving only the "dry" signal. A small knob marked 'threshold' determines the cutoff level; the user should set this knob to allow for sustaining notes.

For a flanger in the \$200 range, this is a well thought-out stage effect. The unit has a crystal sound all its own, and is a pleasing addition to a keyboard set-up or to a synthesizer. Provision is made for plugging a rate control pedal in the back; this will also accept a synthesizer control voltage. Inquiries should be directed to Analog/Digital Associates, 2316 Fourth St., Berkeley, CA. 94710.

CIRCLE 4 ON READER SERVICE CARD

A new addition to the arsenal of portable pianos was recently introduced by the **Aeolian Corp.**, one of the largest piano manufacturers in the Western Hemisphere, whose affiliates include such prestigious names as Knabe and Chickering. Strings and Things in Memphis, which also happens to be the home of Aeolian, collaborated with factory engineers in designing an electrically equipped conventional string piano for use on the road. The Aeolian Melodipro is a 64-note spinet, somewhat smaller (37 $\frac{3}{4}$ " high, 43 $\frac{1}{4}$ " wide, 24" deep) than a console or upright, so the strings are shorter

The **SOUND SHOPPE** REAR ENTRANCE

and it has less actual volume when played acoustically than a bigger piano. But the Melodipro is light and compact, weighing only 230 lbs. Thus it is easy for two people to move, and even falls within the realm of possibility for one person with some ambition.

Aeolian has been making this same piano, a dropped-action spinet, for a number of years, but it was housed in a carved walnut cabinet and intended for home use. The inability of electro-mechanical and/or electronic pianos to capture the true acoustic sound and playing action has always been a source of grief to keyboard players, so Aeolian redesigned the cabinet of their spinet for road use, found the best available piano transducer, and built a traveling piano.

The cabinet which was redesigned to house the Melodipro is made of solid birch and coated with a super resistant fiberglass-based substance called "polene", which resists scratch marks better than any other type finish found on similar portable units, be they electric or not. A total of 5 solid oak runners along the sides and top of the Melodipro serve to further protect the cabinet from damage incurred during transport. Recessed handles are located on the back of the sound board, heavy duty casters are also standard.

Aeolian engineers are eager to show Strings and Things investigators their factory, explaining in detail the production process. "We do everything here at the factory," engineer O.D. Bradford said. "We take the lumber from the mill and finish it ourselves; nothing is done by outside builders. This is not just the final assembly point like some other factories. The only thing that isn't made right here is the cast iron frame, and we own the foundry that makes those, so we have complete control over quality."

The sound board of the Melodipro is made of laminated maple, while the bridge is manufactured of quarter-sawn hard rock maple. The ribs are made of spruce and are locked into the liner for sturdier support of the sound board. The advantage of spruce ribs is that they transmit tone very well, especially when "feathered", or trimmed down as they are on the Melodipro. In addition to the maple sounding board, a supplemental bridge and a box

bass bridge are standard on the Melodipro. The piano action has the same size and weight keys as an upright or grand. The wool used on the hammers has the maximum amount of density possible for a wool hammer of its size. This increases the volume, and this type of wool has been sealed against moisture for longer life.

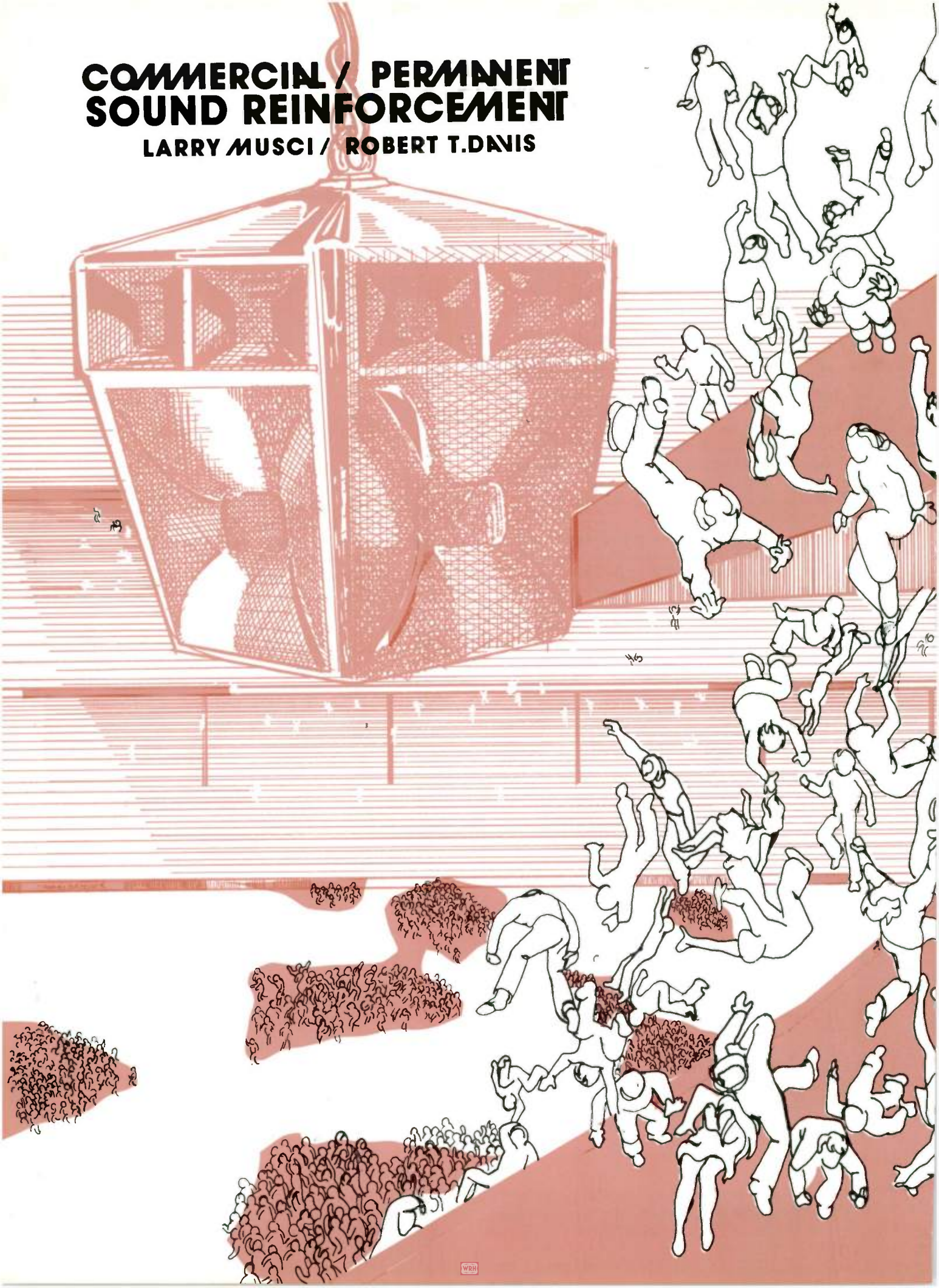
The Helpinstill transducer is installed between the sound board and the strings in order to achieve maximum pickup output with no feedback. The transducer extends under the full length of the strings so it is capable of a balanced output. Mounted on the upper left hand side of the cabinet, there is a 2" x 6" control plate for the pickup, consisting of a volume pot and a five way tone selector switch, which emphasizes specific areas along the length of the pickup; so it is in effect a notch filter which alters the tone of the pickup output.

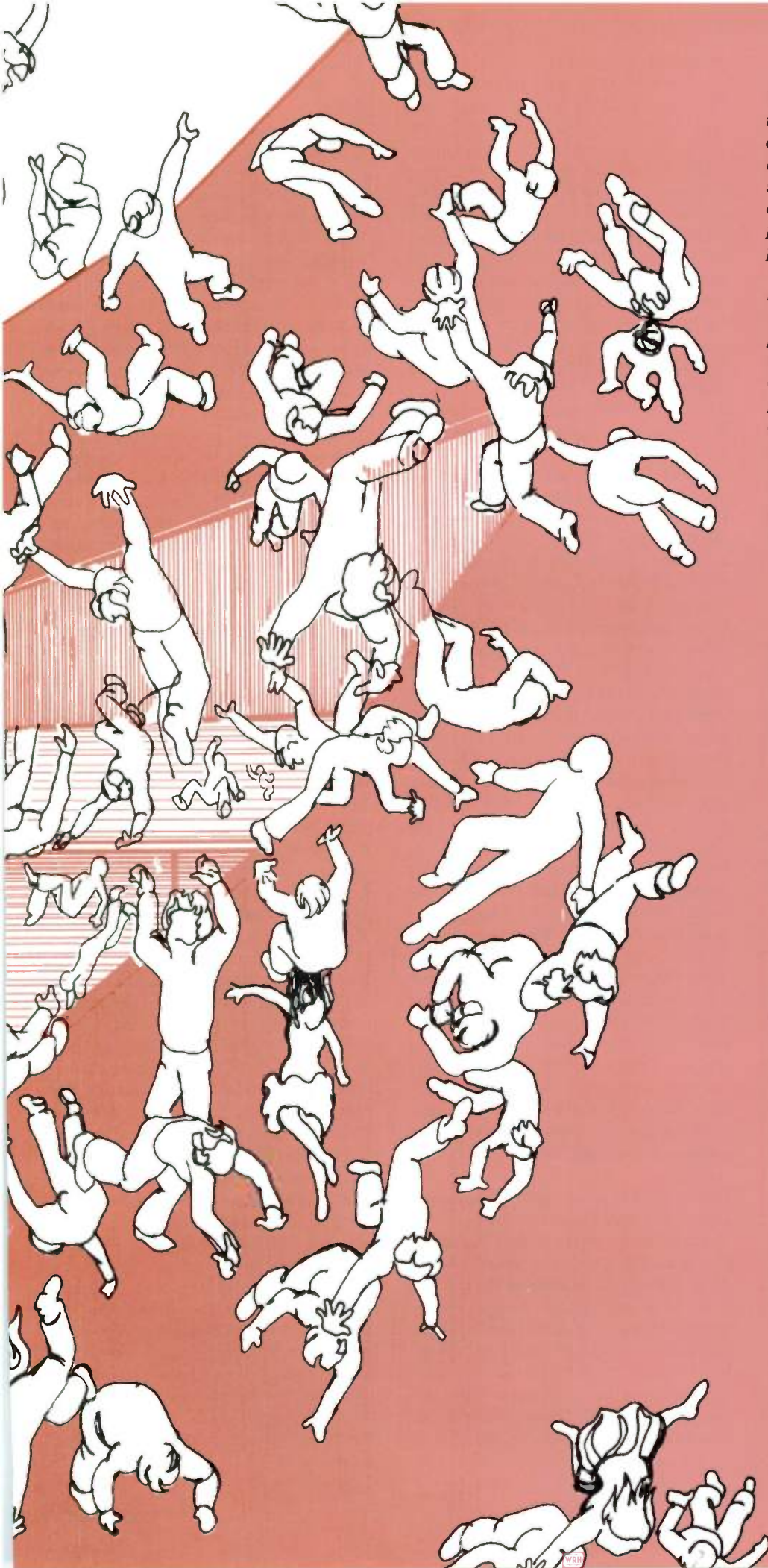
Maintenance of the Melodipro does not seem to be a problem; removal of four screws gives access to the tuning pins, the action itself, and the pickup wiring as well. Infrequent repairs, such as the replacement of a string, would require only the services of a piano technician and not an electronics expert, who often must wait for parts or send the portable electronic unit back to the factory for repairs. Traveling musicians will find it easier to maintain than most portable units. The Melodipro retails for \$1,395.00, less than half the price of portable acoustic/electric pianos built by some other manufacturers, and the Melodipro is built entirely in the U.S. Further info can be obtained by writing The Aeolian Corp., 2722 Pershing Ave., Memphis, Tenn., 38112, or by contacting Strings and Things, 205 So. Cooper, Memphis, Tenn., 38104, (901)278-0500.

CIRCLE 5 ON READER SERVICE CARD

COMMERCIAL / PERMANENT SOUND REINFORCEMENT

LARRY MUSCI / ROBERT T. DANIS





When one thinks of "sound reinforcement" and "high-end" audio reproduction, one visualizes the traveling band and their collection of dinged-up speaker cabinets, high frequency devices, monitor cabinets, signal processors, and a large mixing console placed somewhere in the center of a "sound pressure" area. It's rarely realized that sound reinforcement extends beyond portable, easy-to-package and move systems to permanent/commercial systems, some designed to handle upwards of 80,000 people. The differences in applications are obvious, but the differences in technical approach aren't so obvious. What Sound Arts has done is to contact a couple of well-versed (in different areas) commercial sound experts and asked them to tell the story in their own words.

-Ed.

INTERVIEW WITH LARRY MUSCI/ALTEL SOUND SYSTEMS INC.

Can you give me a brief history of Larry Musci in the sound field?

My history is pretty shallow actually. I've been in the commercial sound business for the past 6 years. My partner, Hank Cattaneo, has been in the business for 20 years and works closely with Paul Anka on all his sound needs. I handle the commercial end, which is the background music systems, paging units etc. One of the largest systems we have done and service is the Bristol-Meyers headquarters at 345 Park Ave. in New York. That was 22 floors to setup and it's all centralized out of one "rack room". The speakers we use are dual voice coil speakers so you can have music over one and a paging voice over the other. We serviced St. John the Devine's Cathedral, which is the largest in the U.S. We've installed Procter and Gamble's corporate offices' sound and paging system. We also set up their telephone intercom system there. Some of the warehouses we installed had dimensions like 300'x200'x40', so you have a lot of cubic feet to cover in your sound and paging system—we use horns there.

Can you explain your partner's involvement with Paul Anka's sound?

He supervises Paul's sound on the road. He'll go into a room and see what the system is. Then he will add to that until Paul has what he needs. He's also

helping Paul install a studio in his home right now. It's an interesting and well-rounded partnership Hank and I have at Atel.

What are some of the component differences between a commercial/permanent system and a portable system?

The cabling used in a permanent system is just that, permanent and you would not need a flexible rubber 'snake-type' insulated cable, as you would use in a portable system. We did New Jersey's Great Adventure Amusement Park's country music concert's sound; we'd set up the stage and then dig a trench to where the console was to be set up on the field and then we'd bury the snake to keep it out of the people's way. So in the portable system you need that flexibility. Your cabinets, in a permanent system using cabinets, wouldn't have to have the protective edges and construction that you need in a portable system. The permanent setup's speakers aren't going to be 'bopped' around in travel. The amplifiers in the two systems are pretty much the same except in portable use those amps have to be cushioned and "cased" for shipping. In the permanent vein those amps would be rack mounted and locked away in a control room.

Will you run down some of the gear that you use in some of your installations?

We use all the top equipment. We don't really show any favoritism toward any lines, if it's just what the job calls for—we'll use it. Some places we'll use Crown amplification and it will be ideal. In another place Altec might be a better choice as a power plant, so we'll use the Altec. We use JBL, Altec, Crown, Yamaha boards and Bozak equipment. We have our more inexpensive lines of equipment, but we try to stick with the better stuff because it's more dependable.

You mentioned Paul Anka's studio installation. Can you elaborate?

Yeah, Hank has a background in studios and we have set up several small studios. So at the present time we're building a studio in Paul Anka's new house, in Carmel, California, where he'll do his own rhythm tracks. It makes it easy for Paul to get some work done without going out to a studio.

When you see that you're doing a cathedral that has a lot of hard sound edges, you must take some sound pressure level readings and measure-

ments. Is that correct?

Yeah we do. In fact we have graduate engineers working for us whose job it is, is to make sure we correctly understand the room's audio capabilities when we install a system. A lot of *that* happens *after* the installation when we do an Acousti-voicing tuning. We'll equalize to the ambient characteristics of the room for maximum performance. Acousti-voicing tuning is an Altec developed procedure that is used by just about everybody in setting up systems. You use a graphic analyzer, which is a healthy piece of audio test equipment.

Can you run down any common problems you have in permanent installation?

Generally the acoustic treatment of the room is a problem. If it is done right then there are no problems and the job is easy. If there is nothing done at all; every wall is going to slap, the floor is hard, the ceiling is hard. At this point we have to be more refined in our approach and set-up. It takes more equipment, lots of equalization, compression, limited signal usage—whatever. You eventually overcome a lot of the problems, but in an acoustically bad room you never overcome *all* of the hassles. In St. John the Devine Cathedral in New York, the system is set up with a time delay. I believe the length of the place is roughly 800' long, so that's two football fields, *plus!* From the voice of the speaker, upfront, until the time the sound reaches the back of the cathedral, you're going to have many milliseconds. So we installed a Phillips Time Delay Tape in there. We just did a job in Puerto Rico, the El Comandante Race Track, and because of the size of the grandstand and where the speaker's were located (hanging from the roof) we had the old "Lou Gehrig" echo thing happening. So we installed a *digital* time delay unit and it will now come out as basically a one voice signal.

It's very hard to get good sound in a stadium-type construction isn't it?

Yes it is. Have you ever seen Anaheim Stadium and heard the sound there? Altec did it a little differently in that they have one single sound source mounted high up in center field and the response is supposed to be excellent. In a stadium you have all the overhang and all those hard surfaces. How are you going to reach those people in the back? Well what you do is place a lot of

small speakers all around and then *that* is when you really need a digital delay.

Any typical problems in maintenance of permanent systems?

Not really if you use good gear in your installation. In the old days of tubes, you'd just go out and change the tubes. But now with solid state, if it's working the first hour, it's generally good for years. You don't generally go back to it, unless the people start playing with the knobs. Once you have your settings, leave them alone. It's worst enemy is heat and we get everything properly ventilated. If every thing is properly ventilated you shouldn't have any problems with solid state gear. It maintains itself very well and it's favorable to leave it on all the time. It draws so little current that you're not really being an energy waster. Turning it on and off is worse for the unit than just leaving it on all the time. It's better for the speakers to have a little vibration going all the time, cause fuzz and dust gathers on them.

INTERVIEW WITH ROBERT T. DAVIS/director systems/applications engineering

Can you give me some of your history in the sound field?

Prior to being with Altec I spent 12 years with various sound contractors in the Midwest. I was with a firm called Technical Service Corp. in Louisville, Kentucky. For the following four years I was working for Industrial Communications in Detroit, Michigan. About 2½ years ago I came to Altec in Anaheim, California. Some of the projects I've worked on include system design of the large ice rink at Michigan Technological University. I handled much of the sound reinforcement work, while I was in Detroit, for General Motors, American Motors, and other car companies. We did their plants, their lecture rooms, conference halls, training facilities, as well as auditoriums. I was involved with the design of "noise masking" systems which is a different ballgame. They are electro-acoustical systems interfaced with architectural systems to allow speech privacy in open-landscaped office areas. I was involved in the system design for Arizona State's new football stadium, Sun Devil Stadium. I was involved in the system design of Adolph Rupp Arena in Lexington, Kentucky which is the home of the

University of Kentucky basketball team. It's a convention center and arena, and the arena at this point, is the largest indoor arena in the United States. It holds about 4,000 more than Madison Square Garden. You differentiate as to an arena and an indoor-covered stadium, such as the Kingdome in Seattle or the Superdome in New Orleans. An arena is kind of a different 'animal' architecturally.

You worked on the system design on some of Montreal's Olympic Stadiums. Can you run down some of the problems and points on that job?

Well there was a lot of involvement by the city of Montreal and several very fine French and Canadian technicians, so there were a lot of people who had input into the design of the system. When you're talking about stadiums, there are a number of different kinds and you approach each one differently. You have covered stadiums, such as the Astrodome in Houston. At the time of the Olympics, the Montreal facility was to have been a covered stadium but it was not complete at the time the Olympics were held. Therefore, at that time it was an open-air stadium—the roof was not in place yet. One of the biggest points that you become involved with in designing a system for a stadium is a knowledge of the architectural acoustics within that particular environment. The geometrics of the stadium have to be considered; where the seating area is, whether it is a totally round, or a bowl-type stadium, or a stadium which is a horseshoe shaped facility, like Arizona State's field. Architectural acoustics is quite a problem and one that *has* to be considered in designing a sound system.

Most stadiums tend to be quite reverberant, particularly the covered type stadium. Acoustical treatment is relatively expensive. That is, putting absorptive material on the ceilings, walls, etc. What you are doing here is trying to "dry-up" the room acoustically and cut the reverberant time, where live entertainment can be appropriately heard without sound reinforcement. Then you have to figure what type of system are you going to install in a particular situation. Are you going to use a high level "point-source system" or do you use a "distributive system." The "point-source system" is the type that is in use at Anaheim Stadium, where you have one large loudspeaker cluster, located close

to the scoreboard area and quite high in the air, serving the entire stadium. In the case of the Olympic stadiums, the main stadium (seating 80,000), the Vellodrome (seating 7,000), or the Piscene (seating 7,000), those were covered stadiums. The Vellodrome and the Piscene had rather long reverberation times. This was due to the materials used in construction, which was mainly concrete and large plexiglass domed skylights. When you're involved with a stadium with long reverberation times, it's very difficult to design a sound system that will render intelligible speech from a "point source system". More than likely you would use a "distributive system." In the case of all the Olympic stadiums we went to a "circumferential distributive system." Which brings the loudspeakers relatively directly over the heads of the listeners, and their array conforms to the seating area. If you have a big ring of seating and a central sports-activities area, the loudspeakers would be placed relatively above that big ring of seating and the speakers are configured in the same sort of ring as the seating area. You try to get the speakers close to the spectators to shorten the path length between the loudspeaker and the spectator. You also try to keep the signal off of any reflective surface except to the audience itself, which is relatively absorptive. By this technique you are not *exciting* the room's natural reverberant characteristics.

Time delay is another factor here I would assume?

Yes, time delay was used at the Montreal Olympic stadiums, because the facilities had tiered-seating all the way around. It is necessary in any arena or stadium system that the high frequencies, provided by high frequency compression drivers and multi-cellular or sectoral type horns, be directed. You have to go by the rule of thumb that high frequencies don't turn corners. You have to have a direct line of sight between the listener and the high frequency horn. When we talk about tiered-seating, that means a lot of spectators were sitting underneath the balcony above them. They would not receive the sound from circumferential clusters. So you have to go right above their heads, and mount speakers on the lower side of the balcony directly above them, and you would install high density loudspeakers rather close together. The audience is then served

by those speakers instead of the clusters which they cannot see. Then it is necessary to use time delay, we use digital electronic time delay. What you do to figure time delay is measure the distance from the overhead distributed loudspeakers to the ears of the listener, and you subtract that distance from the distance of the loudspeaker clusters to the ears of the listeners. As an example you have your high level clusters 100 feet from the ears of your listeners, while the distance of the distributed speakers is 10 feet to the listener's ears. You then subtract the smaller number from the larger figure and you have 90 feet "path difference." You take that 90 feet times .885, which is the length of time in milliseconds that it takes sound to travel 1 foot (given that the speed of sound is 1133 feet per second), and that would give you roughly (rounded off) 80 milliseconds of digital-electronic time delay that you would use to "even out" that signal flow through the stadium.

Do you have to take sound pressure level readings in these places?

Absolutely. There are two ways of doing this. One is in the way that the arena is a new construction and you can work from blueprints on a drawing board, with all the distances and measurements spelled out. The second method is dealing with an arena that is already built. You're simply then going in to provide the sound system for that existing arena. When you're working with new construction you have many acoustical calculations to make. You have to do an acoustical-environment analysis in which you can predict reverberation time and flutter echo. You're in a position at that point to ascertain whether or not, or for that matter, how much absorptive material is necessary to install to cut down on reflective surfaces. If it is perceived to be a very acoustically 'dead' room, you may want to make it a more *lively* room. But in the area of a stadium-system you're talking about *reducing* the reverberation. You don't want long reverberation times if you can help it. The reason why is (and let me just add that in the English language we average 3 to 4 syllables per second in spoken language. German language, in the spoken sense, averages about 5 syllables per second) that you get into a room that has a 5 second reverberation time, and you speak over a sound system in the

English language (at 3 syllables per second) you could speak 15 syllables before the first syllable died away into inaudibility. Of course that would tend to mask, confuse, and garble speech in that arena. What you're working for is getting that reverberation time, of that particular space, down to a suitable number (a second to a second and a half). This is depending on what type of program material you intend to have in that arena. That could be from hockey games, to boxing matches, to string quartets—the way arenas are used now! If you can get that reverberation time down enough to make speech intelligible and long enough to enhance music . . . you're working toward a compromise!

Can you run down some of the components used in the Montreal sound system?

Surely! In the Montreal system there were a couple of things to be considered. The architectural considerations meant that we needed to select loudspeaker equipment that has relatively high directivity factor, or cue. As an example you want equipment to perform more as a spotlight instead of a flood light, if you were to

relate this idea to lighting. The horns that we chose for the job were high cue, or directivity factor, Altec 203B (20 degree × 40 degree) multi-cellular horns. On the rear of the 203B's were 290 high compression drivers, which are designed to handle 100 watts of audio power. The low frequency units were Altec 815 horn-loaded low frequency cabinets which house 2-15" 421 type 8H woofers. The bass boxes were horn-loaded rather than reflex because the horn-loaded cabinet has a higher directivity factor than a plain bass reflex type box. The amplifiers that back that up were Altec 200 watt Model 1590 and 100 watt Model 1594B amplifiers. Everything was transistorized.

Can you explain the control centers for such a system?

In Montreal they had rooms in the Olympic facilities designated for sound equipment racks. The power amplifiers were located in those racks. The rooms they were in were appropriately air-conditioned. All the mixing equipment was Canadian-made MacCurty consoles, and equalization gear, Altec 1650 third-octave band filter sets, and all the "front-end" gear

was located in audio control rooms. These rooms had a view of the sports and activity area. In the case of the large Olympic Stadium we used 22 loudspeaker clusters circumferentially around the ceiling. Those were all on motor driven wenchers that allowed us easy access for maintenance. The contractor was RCA Ltd. of Montreal, and they did excellent work on the project. A guy named Tito Caluori supervised the whole show and was quite pleasant to work with—he did a great job!

What is your procedure for selecting microphones for such a system?

Again, this depends on what you're doing and what you want. Microphones for announcing sporting events should be something of a "press-to-talk" unit so that the mic doesn't stay *live* all the time. One thing that is extremely helpful is to come up with a cardioid or hyper-cardioid microphone rather than an omni-directional microphone. This is so you can have some control and definition of the voice of the announcer and the ambient sound of the stadium and its fans.



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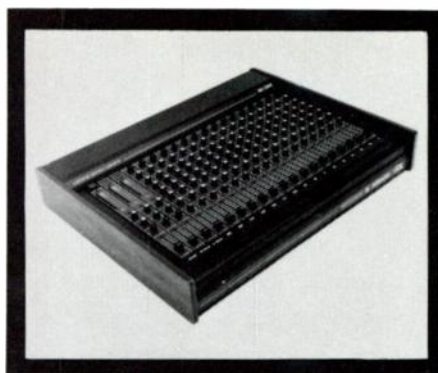
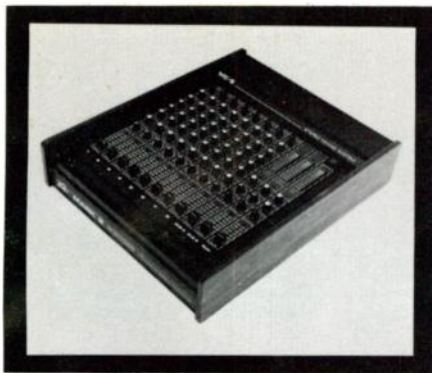
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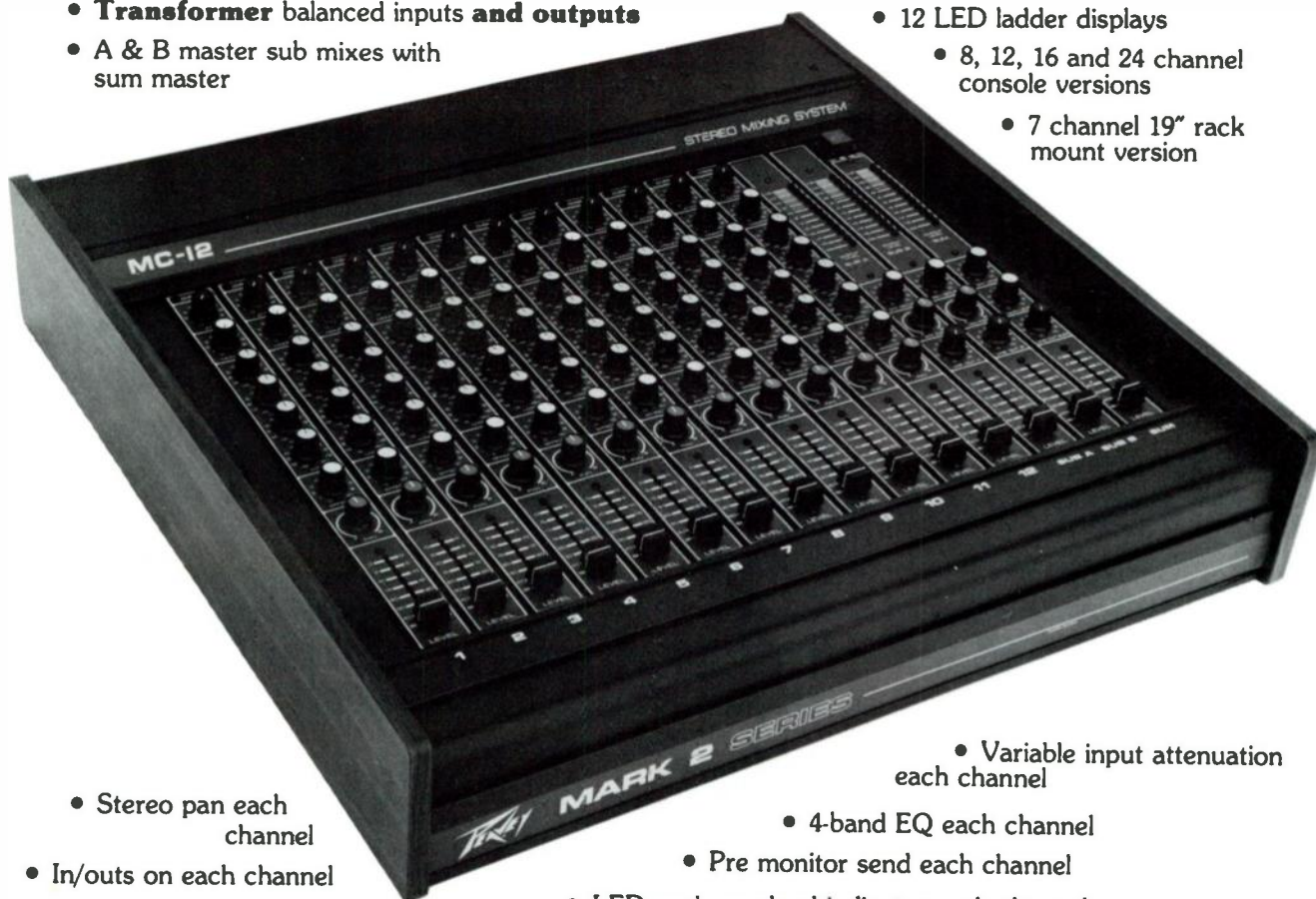
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COLLECTOR & ITEM

Rick Nielsen is a brilliant guitarist with an exceptional band, Cheap Trick, with a fantastic guitar collection; Nielsen's electrics currently number near 50. Now, for a man who doesn't buy and sell instruments for a living, that's a healthy multitude. Not only are Rick's electrics in abundance, but so is his collection of acoustics, but since *Sound Arts* deals with electric instruments, we thought we'd show you some of his electric guitar "stable."

Having started playing guitar so long ago he can't remember how old he was, Rick's first axe was an early Gretsch and as Nielsen says, "I've owned most every model of 'decent' electrical guitar ever made." So intense was his fascination with older instruments, Rick began selling fine guitars to some of rock's biggest stars. Peter Green, ex of Fleetwood Mac, bought 1958 and 1959 Stratocasters from Nielsen, while Jeff Beck acquired an older Les Paul sunburst for a mere \$350.00.

"Back when Jimmy Page was with the Yardbirds he asked to see some of my guitars," remembers Rick, "we met and he looked over some instruments, but I never sold him any."

Rick's obsession with "antique" gear extends beyond guitars all the way to his selection of speaker enclosures. Anyone who has seen Cheap Trick onstage can't help but notice Nielsen's numerous "damaged" vintage 1967-68 Sound City 4X12 cabinets. According to the mobile guitarist, "The reason those grills got ripped-up was due to faulty speakers. Kicking it in is one way of getting a speaker to quit when it's bad."

Pictured here are a number of Rick's electrics as well as several of bassist Tom Petersson's 1963 and 1964 Gibson Thunderbirds. [That's Tom 'hid-



TORS

Rick Nielson's Musical Instrument Assemblage



ding' behind one of his 'birds.')] The final photo includes all the instruments, out of Rick's collection that he is currently touring with. Not pictured are two new Hamer 10 and 12-string basses as well as a new Hamer-designed electric mandocello. The following includes many of Rick's electrics illustrated here.

FENDER:

- 1950 Telecaster
- 1951 Telecaster
- 1956 Stratocaster
- 1957 Stratocaster
- 1958 Stratocaster
- 1959 Stratocaster
- 1959 Musicmaster
- 1960 Stratocaster (left-handed) with 1956 Telecaster neck
- 1961 Stratocaster
- 1963 Precision Bass
- 1963 Fender XII
- 1963 Jazzmaster
- 1963 Jaguar

GIBSON

- 1955 Les Paul (gold top)
- 1956 Les Paul Jr.
- 1957 Les Paul Jr.
- 1958 Les Paul Jr.
- 1958 Les Paul Special
- 1958 Flying-V
- 1958 Les Paul Standard
- 1959 Les Paul Jr.
- 1959 ES-345
- 1960 Les Paul Jr.
- 1960 EBO (Les Paul shape)
- 1960 Les Paul Special
- 1960 Les Paul Standard
- 1963 Firebird
- 1963 Thunderbird
- 1963 Thunderbird
- 1964 Thunderbird

PHOTOS BY RICHARD KWASNIEWSKI/STAR



GUITAR SYNTHESIS

PART

A
NEW
WAVE



SIZERS

Two:



360 SLAVE DRIVER

By Bob Easton

It was in 1972 that 360 Systems started to make guitar synthesizers as custom made devices for professional musicians. It wasn't until 1976 that 360 started producing guitar synthesizers for the consumer/musician at a retail level. The first system we made was fully polyphonic, as opposed to the "single line" systems. That particular unit features one complete synthesizer for every string and allows each of the six synthesizers to be voiced entirely independent of each other. It follows slides and bends by the guitarist and actually performs all the functions the keyboard "machines" do. It was designed primarily as a learning exercise in what guitar players really wanted and how to actually provide for that. We found that a lot of the features that are valid on the keyboard instruments didn't necessarily apply to the guitarist. These units were expensive, priced at around \$10,000, and are still manufactured today. The unit is the only truly polyphonic guitar synthesizer system currently available today; that is it is one that is capable of playing in any octave, and has voltage controlled oscillators that can produce arbitrary wave forms.

The primary product we're really into now stems from that advanced system and it overcomes many of the difficulties in the polyphonic system. The primary characteristic is that it is a lead machine. Let me back up and say that an important thing for the music dealer to know about guitar synthesizers is that they fall into two categories. First, there are "lead instruments," much in the same way that keyboard synthesizers are commonly "lead instruments." Then there are other kinds of guitar synthesizers on which you can play chords. The two should not be compared directly because there is a great difference in price and the intended function of the units. Most pop music played today is "single-line" material and there usually isn't much chordal content in it. So the need for a polyphonic system in rock and roll music is certainly much less than in other kinds of music. Our primary market is pop music performers and the system serves the con-

sumer better on a price and performance level. It helps the dealer out in that it allows him to offer a guitar synthesizer system that is more accessible to the consumer because of its price and ease of usage.

The area that 360 Systems has addressed itself to in its single line guitar synthesizer is *price*. It's a component system and consists of three pieces: the user's guitar, and our guitar-to-synthesizer interface called the Slavedriver, and the synthesizer itself. The key advantage to a component system is that the type of guitar one wishes to use can be selected by the customer. The kind of synthesizer he wants to buy can also be *selected*. This factor means that there is a lot of latitude in the total price of the system. The total cost of a unit can be as low as \$1090.00 or a typical system

der the "strap screw" at the back of the guitar. A twenty foot multi-connector cable hooks up the six-channel transducer to the Slavedriver. The reason for the six-channel transducer, or hex-pickup as we call it, is to provide separation between the six strings so the computer in the Slavedriver can decide which note is being played on which string, instantly. That information must be then conveyed to the synthesizer. Earlier systems that we made, but didn't market, attempted to use the standard guitar output, but it's impossible to get fast and accurate syn-

available for processing through the synthesizer's filter. The sound output is called *pitch-control-voltage*, this is the voltage that corresponds accurately to the pitch of a note played on the guitar and it tells the synthesizer's oscillators what note to play. The third output is the *loudness-control* output, which is unique to 360 Systems' unit. It will enable the synthesizer to copy the dynamics of how the guitar is being played, not just the pitch on the beginnings and ends of notes. In other words, if one plays softly, the synthesizer will respond softly. If the guitar is played very forcefully, the synthesizer will react in the same manner. The fourth output is called *trigger* and this initiates the filter sweeps that are characteristic of synthesizer sound. The four outputs *together* contain all the information in a guitar performance and it is translated into a convenient form that allows the synthesizer to produce a "parallel-performance" while interpreting the voicings we want to hear out of the unit.

One of the better price/performance units we find is the Oberheim Synthesizer Expander Module in connection with the 360 Systems' Slavedriver. This produces a package on the retail level of \$1490.00. The Expander Module has three oscillators, two of which are voltage-controlled, the third one is used for modulations, and it also has a filter that can produce four filter modes selectively. The module has two envelope generators capable of vibrato and pulse-width-modulation as well as most of the features found on today's most popular keyboard synthesizers. By itself the Expander Module sells for \$695.00. Probably 80% of the retail stores in the country selling guitar synthesizers, sell the Oberheim Expander Module together with the Slavedriver.

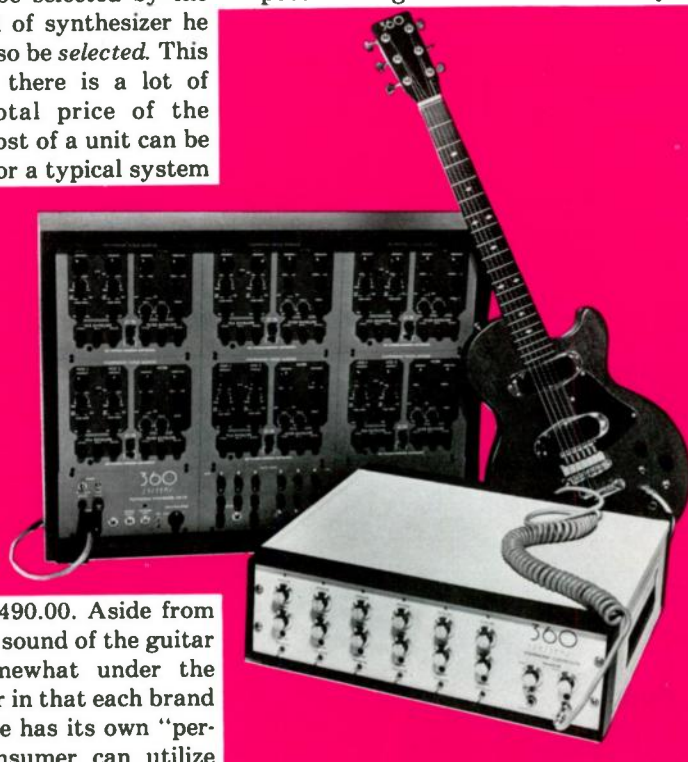
The artists who have used, and do use, our systems are many. Lee Ritenour has one of our fully polyphonic systems. Other people using the Slavedriver system are Joe Walsh of The Eagles, we have an order in for Jimmy Page of Led Zeppelin, Rob Royer of Bread has been using a system of ours, as well as Rick Ellswit of Doctor Hook, who is touring with his unit. We also manufacture a unit to be attached to a Fender Precision Bass, and that unit is used by such people as Lee Sklar, with The Section and Jackson Browne, and Mirislov

would be about \$1490.00. Aside from adjusting cost, the sound of the guitar synthesizer is somewhat under the control of the buyer in that each brand of synthesizer made has its own "personality." The consumer can utilize just about any synthesizer made to interface into his guitar system. This point proves to be a very good sales item. The Slavedriver itself is about \$795.00 and in many cases the customer will have his own guitar and somebody else in his band owns a synthesizer. He's able to just plug into that! It's then possible for *that* customer to come back later on to buy another synthesizer to use continuously with the Slavedriver.

As with all other guitar synthesizers marketed today, the 360 System's Slavedriver has a miniature six-channel pickup that attaches to the solid body electric guitar of the owner. The actual pickup is about a ¼" wide and about 2½" long and it is normally installed between the treble pickup and the bridge of the guitar. It can be easily mounted with two screws. It has a seven pinned connector mounted un-

thesizer performance following those techniques. Contrary to what it may seem, we have had no customer objection to the mounting of the pickup on their guitars. The serious customer normally views it as a permanent installation. If the pickup is removed it just leaves two small 1/16th" holes in the guitar, which can be fixed, but it is generally not viewed as a problem by the serious customer.

The Slavedriver itself can be looked at as a go-between that translates the guitar playing information to a form that is understandable by a majority of the synthesizers on the market today. In keeping with the voltage-control concept, the Slavedriver produces four simultaneous outputs which are connected to the synthesizer using the patch cords provided. The first of these outputs is just the amplified guitar sound, and it is made



Our point of view:
You can't know too
much about a good
thing. Number 33 in
a series of factual
discussions.



audio-talk from audio-technica®

MICROPHONES, Basic Term No. 2 Condenser

In our last issue we introduced the first basic microphone term: Dynamic. Now let's discuss the other popular method of microphone construction for high fidelity applications: The Condenser. It's our Basic Term Number Two.

THE BASIC CONCEPT

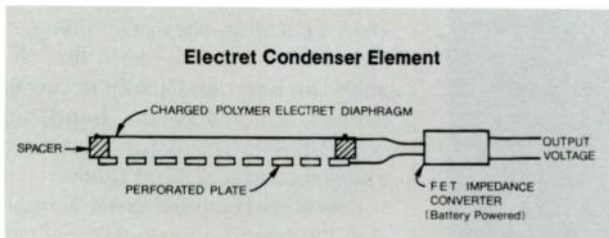
Condenser microphones use a lightweight membrane and a perforated plate that act as opposite sides of a capacitor or "condenser". Varying sound pressure against the thin polymer film causes it to move. This movement changes the capacity of the circuit, creating a changing electrical output. In many respects a condenser microphone is similar to an electrostatic tweeter, although much smaller in scale, and used to pick up sound, rather than to radiate it.

TWO BASIC TYPES

There are two kinds of condenser microphones currently available. One type uses an external power supply to provide the polarizing voltage needed for the capacitive circuit. These are almost exclusively intended for professional studio use. A more recent development is the "electret" condenser microphone.

THE ELECTRET CONDENSER

In electret condenser microphones, the polarizing voltage is impressed on the diaphragm (or plate) during manufacture, and this charge will remain indefinitely. No external power supply is needed, thus reducing cost, bulk and complexity. An FET impedance matching circuit is a necessity, powered by a small low-voltage battery usually located within the microphone body.



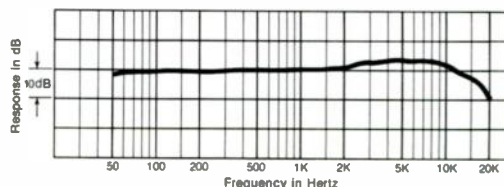
Both types of condenser microphones (externally-powered and electret) are capable of state-of-the-art performance.

The lower cost of the electret has made it popular for home and semi-pro recording, as well as major studio operations.

THE ADVANTAGES OF THE ELECTRET

Electret condensers are noted for their uniform, peak-free frequency response, and ability to respond with clarity to transient sounds. The low mass of the diaphragm permits extended high frequency performance, while the diaphragm's high compliance insures outstanding low frequency response as well. The resulting sound is clean and natural, with excellent transparency and detail.

Typical Electret Condenser Frequency Response (Model AT801)



SOME OTHER TYPES

There are a number of other ways to translate sound into electrical energy in addition to the condenser and dynamic principles. Carbon granules are used in telephones and communications microphones. And many low-cost microphones use crystal or ceramic elements that are generally OK for speech, but are usually not seriously considered for demanding musical reproduction.

One other type found in recording studios is the ribbon microphone. A thin metallic ribbon (that serves as both "voice coil" and diaphragm) is stretched between the poles of a magnet. While capable of excellent performance, the ribbon must be protected from high acoustic pressures and wind. Because of its relative fragility it is usually found only in recording studios. Ribbon microphones are often designed to respond to sound from both front and rear (the so-called bi-directional or Figure 8 pattern). Which brings us to another way to describe any microphone...by its ability to pick up sound in various directions. And that leads us to the next two basic terms, to be covered in our next issue.

Jon R. Kelly
Vice President & General Manager



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CIRCLE 88 ON READER SERVICE CARD

Vitous who is the former bassist with Weather Report.

It seems that synthesized music and synthesized sound is beginning to "open up" to more and more musicians. Percussionists are now able to use synthesized sound, guitarists and bassists, of course, are now sampling the synthesized field, while keyboardists have had it at their disposal a bit longer. I think that the desire for this is sparked, to a great degree, by the musical intensity capable in solo performance on a keyboard synthesizer. Traditionally guitar players have enjoyed a better solo situation onstage. There is an air of better showmanship in standing up and performing in the spotlight rather than sitting down behind a stack of keyboards. The electric guitar, as we know it, doesn't produce a lot of the sounds people would like it to have. The example set by keyboard synthesis is very much coveted by guitar players and the guitar synthesizer makes these items available to that guitarist.

2000 PATCH AMPEG

By Willie Avont

Soon after it was discovered that the synthesizer could be controlled by a simple keyboard (thank you, Dr. Moog and other early pioneers), it became obvious that bass and guitar players would like to make the same "groovy" sounds. It would be even better to accompany yourself on bass or guitar with these new "tasty" tones. Ever watch a lead guitarist in action? Although they are typically faster than lightning, they still have to play with *both* hands and *both* feet to stay with the band and make it through a break. They like to bend notes, sometimes *with* other instruments, and sometimes *against* them.

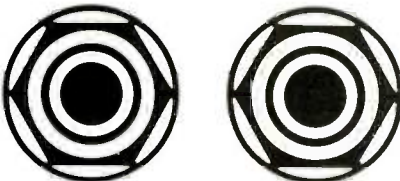
Life with the band is no simpler for the keyboard synthesist. Although only one hand is required to play the keyboard, the other hand is busy making adjustments on the synthesizer that allow the tones to dissolve from color to color. Their feet are busy bending tones (synthesists like to do that too), and adjusting portamento that allows the synthesizer to leap or glide from note to note. In either case, the music produced is worth the hassle as it is truly magnificent.

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Synthesizer we wanted the best of both worlds. Something simple to play, very fast, rugged, completely independent from guitar or bass, and easy to repair in emergency situations.

The 2000 Hagstrom guitar or bass is fitted with a wired connection to each string and each fret. Simply touching a string to a fret *plays*. A simple rocker switch on the pickguard turns the system on and off. Since the pitch of the guitar string, whether or not it's being played, has nothing to do with the note produced by the synthesizer, the systems are completely independent. You don't have to pluck a string to play the synthesizer so your right hand is free to dissolve from tonal color to color, adjust vibrato, or other functions as you play, just as keyboard artists currently do. A small, highly flexible cable connects the bass or guitar to our pedal unit. This unit is made of heavy duty cast aluminum and is literally built like a tank. You could probably run over it with a Corvette while playing a riff and nothing more serious would happen than the music gliding up an octave and a 5th, but I definitely don't recommend it!

There are two pedals on the pedal unit. The left pedal allows you to bend

a tone a full octave, and that octave is perfect. The bending is gradual at first to allow control of slight bends, the kind that guitar players commonly use. Between the two pedals is a small footswitch. Pressing this gives a perfect 5th. We chose this because it can be used to fill out any musical chord structure. It will not clash with major or minor 3rds, diminished chords. In short, you know you won't clash with the band while playing free form improvised music. If you wish to play any other harmonies, they are all available by using the pitch pedal on the right, a very important function for the synthesist, that of portamento. Since the portamento controls on most synthesizers don't work from the external inputs, we had no choice except to add this function to our pedal unit, thus two pedals. Portamento allows one to leap from note to note like a piano does, or glide smoothly like a trombone.

We wanted a bass or guitar player to be able to play any synthesized sound he had ever heard, and create new sounds himself. That meant we had to be able to play anyone's synthesizer, be it Moog, Arp, Oberheim, Steiner-Parker, etc. While 1 volt per octave

pitch is standard in this country, triggering requirements are not. We provide 3 triggering outputs to cover these requirements. If you want a Moog sound, or an ARP sound, you can get it because you can play *that* synthesizer. Most later model synthesizers have a feature called *legatto-triggering*. This means that if you hold a key down then press a higher key you will trigger a new note. You don't have to release all keys, simply press another key to make a *new* note. We added this feature. If you have an older synthesizer that has never before had this feature, it *will* with Patch 2000. With *legatto-triggering* and *two-octave-touch-control* of the synthesizer in the palm of your hand it is possible to develop some very fast styles, much faster than with keyboard, and completely independent of the regular guitar sound.

One can play syncopated styles by first playing the note with fret contact, then playing a guitar or bass note by plucking the strings late. You can play unison or any harmony you choose, and change as you play. Naturally, you can play only guitar or only synthesizer, but the greatest challenge to the artist lies in self-accompaniment.

Lastly, we wanted a piece of equipment that could be easily repaired by a novice technician in an emergency situation. Our I.C.s are plug-in, not solder-in. No more ruined circuit boards or 3 hours of labor to change a 50c part. The wiring of the circuit board is printed on top of the boards, making tracing the connections obvious. Going from "micro-servicing" to "macro-servicing," we designed the system to use modular interchangeable parts, all plug-in! There is one simple plug-in board on the unit's guitar and bass, these are interchangeable. The top casting containing the two pedals and 5th switch is a plug-in part and interchangeable. The casting contains two circuit boards, also plug-in. The small circuit board, which contains the power supply, may be plugged in two ways. One, for 110 volts, and one for 220 volts. Europe—*without* lugging converter transformers!

Although the digital circuitry is as rugged as the cast pedal unit and malfunctions of any kind are highly unlikely, it's nice to know you have sixty second repair capabilities if you need it.



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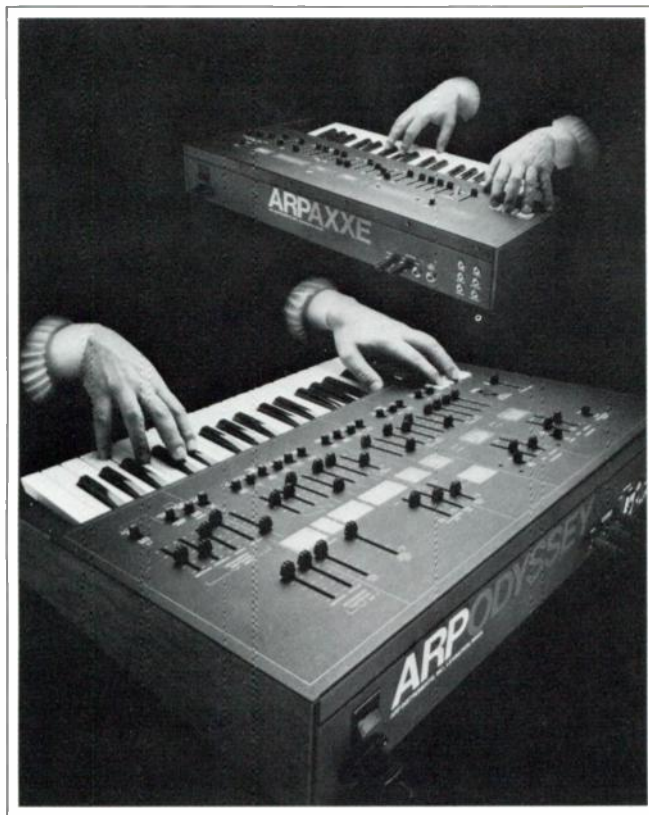
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K.I.S.S.



Keep It Simple Stupid!

By Bob Hoffman

Natural potato chips, natural gas, natural frequency response, natural childbirth and natural cosmetics are just a few of the thousands of products and/or concepts which carry the "natural" label. Natural means easy, simple, uncomplicated, non-threatening, and, ironically, in a very complex and technologically-oriented society, natural has become the most successful concept of the 1970s.

The word "natural" successfully conveys a very relaxed, normal, and honest feeling. This article happens to be about natural selling; relaxed, normal, and honest selling. Natural selling is not for everyone, because it requires a salesman to sell with his heart as well as his head. Natural selling is simple and straightforward interaction with your customer. And natural selling is a concept that, when properly applied, will leave your customers satisfied with their purchases, satisfied with your service, and satisfied enough to come back to you the next time they need a product that you sell.

Admittedly, some stores in the creative audio and musical instrument field do not permit natural selling. If the store owner or manager is overstocked on a particular product, or makes a better buck on one product over another, the salesman is literally forced to sell what the boss wants to sell. If you work in a store that follows this procedure every working day, this article will only help you realize the enjoyment you are missing as a salesman. Every store deals with excess inventory, manufacturer special prices,

promotions, and "dumps" as they are known in the industry. The natural selling concepts outlined here will not apply in every sales situation but, whether you are selling high-priced merchandise or economy merchandise, the ideas presented here should help you improve your salesmanship and provide you with more satisfying relationships with your customers. In other words, this article will help you make more money.

Product Knowledge vs. Customer Knowledge

The creative audio or musical store is a place where product knowledge and a salesman's ego often obstruct honest and direct interaction with customers. Sales people in pro audio and electronic musical instruments have a tendency of talking down to their potential customers; coming off as the self-appointed wizards of one or more product categories. This is not to say that product knowledge is not important, for it is essential in natural selling. However, consider this: what you know about the product is not as important as what you know about the customer. In order to sell effectively, find out who your customer is!

Who Is Your Customer?

The more you know about a prospect, the more you will be able to satisfy his needs. The key is simplicity. Conversation is a natural give and

take process. Ask questions, and answer questions, in a simple and direct manner, and show a genuine interest in the customer from the beginning.

If your customer is a musician, you should know what kind of clubs or halls he plays. You should know what kind of music he plays, what equipment he owns, and whether or not his current gig is paying well, paying poorly, or not paying at all. Asking questions will supply you with very valuable information, and some of this information will be used to close the sale. For example, learning the type of equipment your customer already owns will tell you the amount of money he has spent in the past. If he is working regularly, he will probably be able to afford higher quality. Is the customer looking to upgrade his equipment, expand his equipment, trade-in his equipment and, if so why? Most customers have very specific reasons for wanting a particular product, and it is the salesman's job to discover what those reasons are. Maybe the customer has a friend who has recommended a product. Perhaps the customer was influenced by advertising, or by an article in a magazine. Find out why the customer wants the product. And if the customer wants something he doesn't need, but is lacking something he could use, the salesman has an opportunity to show the customer alternatives to his original inquiry.

Up to this point, the salesman has been finding out as much information as possible about the customer—who he is, where he works, and so on. This

information was obtained in a normal conversational manner; no pushing for the sale, no spiels on product features, just good old natural conversation. Through this conversation you are able to establish a relationship with your customer and at the same time gain information about your customer that will help you satisfy his needs.

Unfortunately, salesmen are notorious for doing what appears to be easiest, and many will take a customer directly to the product requested, quote a price, and wait for the customer to reach for his wallet or sign on the dotted line. If the customer is confident and knowledgeable, he may reach for his wallet or take pen in hand and that will be the end of it. If the customer doesn't know anything about the product but, to avoid the embarrassment of appearing stupid, reaches for his wallet, the salesman has several problems: a) the customer has purchased something he doesn't need, b) the customer has purchased something he really can't afford, or c) the customer has purchased something he knows nothing about.

The salesman counts his commission without realizing that: a) he has not satisfied the customer's needs, b) the sale is in jeopardy because the customer may return the product, c) he has lost repeat business due to customer dissatisfaction, and d) he has lost four additional customers (on the average) whom the customer would have recommended had he been satisfied with his initial purchase.

What Does Your Customer Need?

The natural way to find out is to ask. A professional salesperson finds out the application, the use, the *benefit* the customer hopes to derive from the product he is interested in seeing or buying.

Again, your knowledge of the customer and who he is will help you determine whether he needs this

product for large halls, small clubs, integration with other products, mobility, recording, whatever. You need to know the limiting parameters as well. Will the whole band be splitting the cost of this P.A.? Will they be expanding their instrument, requiring additional capability from the P.A.? Will they have backup equipment or will they require maximum reliability from the mixer they will buy? All of these questions are necessary, and all of these questions help to increase customer satisfaction and increase the size of the salesman's commission check.

Take Care of Your Customer's Needs and Commissions Will Take Care of Themselves

Taking care of the customer's needs may mean recommending and selling the customer a product he may not think he can afford, or a product he may not believe, at first, will satisfy his needs. The natural salesman knows his customer and really understands the application, the budget, the music, the *need*. If you have established that a customer needs a particular product more than he needs the product about which he originally inquired, the professional salesman has an obligation to sell him the product that will satisfy his needs. This involves selling the benefits.

Why Should Your Customer Buy This Product?

If you don't know why, you shouldn't be selling the product in the first place. But if you have shown a genuine interest in helping the customer determine for himself, with your assistance, what his needs are, you will be able to relate all of the benefits of a product to the needs of the customer.

Selling the benefits of a product is impossible without knowing what the customer needs. In store after store, from one end of the country to the other, I have observed salesmen explaining product features to customers who don't have the slightest idea *how* these features will benefit them.

As an example, synthesizers can be fairly complex products to a first-time synthesizer buyer. Many retail salesmen have tried to sell a synthesizer by describing how many oscillators, filters and modulators are included on the control panel, only to see the customer leave the store more confused than when he came in. Rather than qualify the customer's wants and needs first, the salesman takes him to a rack of synthesizers, all of which appear to be complex, and begins explaining synthesizer theory, technology, and electronic sound processing. The customer, who really would like a synthesizer for his four-piece rock band, receives an onslaught of complex signals from the salesman that may take him months to decode before mustering the courage to ask about synthesizers again. The salesman has achieved nothing, and lost everything, because he has lost sight of the customer's interests.

Product knowledge is often useless because none of it relates to the customer's need, something that must be remembered constantly when selling electronic products in the music and audio fields.

Specifications are wonderful, and electronic innovations are the name of the game, but in the one-on-one customer-salesman relationship, nothing is more important than finding out who a customer is, what he needs, and leading him to the product that will satisfy those needs. The salesman who follows the natural sales method from initial contact through signing on the dotted line will get, and deserve, increased business, increased sales commissions, and increased customer loyalty.



BY STEVE CARAWAY

Photos By Steve Caraway

DEALER DOSSIER

Levin's Washington Music Center Washington, D.C.

Some seventeen years ago Chuck Levin started his music store in our nation's capitol just to find that seven years into his successful situation he had to pick up the whole "shootin match" and move. It certainly wasn't the lack of business that had Chuck and sales-staff scurrying for Wheaton, Maryland, it was simply one of the worst riots in the history of this country. In 1968, when Martin Luther King was assassinated, the city of Washing-

ton, D.C. saw looting and rioting in the streets. The only things left out of the entire Music Center facility were a couple of burned out and melted snare drum rims. Everything was lost and the situation was bleak. After moving to Wheaton, Chuck and his wife Marge built Chuck Levin's Washington Music Center into one of the largest and most respected musical dealerships in the United States. Today those burned out drum leftovers are mounted on a plaque over the work area at the Music Center, while business is booming. *Sound Arts* went

to Maryland just to see and hear about his particularly fine dealership and spoke at length with Chuck and Marge's son, Alan Levin, about the outlet.

* * * *

Explain the history of Chuck Levin's Washington Music Center.

Levin: Well, we were in downtown Washington, D.C. and the riots of 1968 leveled us. It was the only time

and then the companies, that we had worked with, rode with us for a few months. I think it helped make our name a little bit better in their eyes. We didn't pack-up or give-up or open under a different and new name.

What are the basic business 'thrusters' at Music Center?

Levin: We deal in just about everything from brass instruments, to guitars, to PA systems, synthesizers, microphones, effects ... *everything* really, except upright pianos and harps! We service a lot of brass bands in this area. We have complete electronic repair department, a fine guitar service and repair staff, and a group of 'crack' brass and woodwind instrument servicemen. We offer the consumer complete service and sales. We have, in our outlet, about 30,000 square feet and our brass and guitar repair shops are located next door in a separate smaller building. So we service everything that we sell.

Is your store departmentalized?

Levin: Not really. Customers, a lot of the time, will prefer to deal with one man. By that I mean he'll come in and find the salesperson he generally deals with and if that salesman says, "Not me, go over and see that guy in the drum department," the customer loses that personal touch. I think if you department everything off, you really lose that feeling of a "store". In our store if a guy sells guitars, and a customer, who is looking for a mixer, comes in and approaches that guitar salesperson, who he has dealt with before, the guitar salesman will take the customer over to our PA area and work *together* with our PA man on the floor. When you come in to our store, everything is out. It's not like everything is in a glass case. If someone wants to try an amplifier, go



ton, D.C. saw looting and rioting in the streets. The only things left out of the entire Music Center facility were a couple of burned out and melted snare drum rims. Everything was lost and the situation was bleak. After moving to Wheaton, Chuck and his wife Marge built Chuck Levin's Washington Music Center into one of the largest and most respected musical dealerships in the United States. Today those burned out drum leftovers are mounted on a plaque over the work area at the Music Center, while business is booming. *Sound Arts* went

we made the front page of the Post! It's my father's business and he is there all the time, he really runs the show. After the riots we had to build another inventory, so we did it in a very fast way. We started looking for a new location and actually we couldn't have found a better location than we did. It just so happened that the location that we are in now was available. It only took a couple of months until we were in the building with a complete inventory, and we were back where we were business-wise. We paid everybody off who we owed money to

ahead and try the amplifier. If a customer wants to try a guitar, OK try the guitar! The store is one big square room. Now, however, we are putting in a sound room and that will be the only thing enclosed. That's just a matter of "sound." What will be displayed in our new sound room will be TEAC and Tascam stuff, other recording gear, as well as our line of sound reinforcement gear. Right now we have a section where we have this semi-pro and pro equipment, in fact the store is set-up according to items. In other words, all the amps are together, the PA/recording section, guitars line the walls—but it's not sectioned off. In the PA section we have everything wired through a switching box so that full demonstration is possible. That is an area, sound reinforcement and home recording, that has grown by leaps and bounds. It's so sophisticated now, it has to be in an area by itself. A customer now isn't going to buy an old Kustom 200 PA with two columns, those days are gone.

Do you think that that is where the sales trends and knowledge is going with today's consumer/musician?

Levin: Yeah, I don't think everyone will understand *everything*. Ten or fifteen years ago if you said to a guy, "You need a BGW or a Yamaha power amp, and a separate mixer, and cross-overs, and high frequency horns and drivers." He would have said, "WHAT?" He would take up being an accountant because he didn't want to get involved in it. Now it's the opposite. Everybody wants good sound and a mini-studio. The selling point here, though, is you can't over-sell somebody in this area. What I am saying is that if a guy comes in and he's playing small clubs, he's not going to need 1000 watts of power. You have to tailor the items to each customer's needs. Another point here is that *we* don't disappear after the sale is made. If the customer has a problem with a system, we'll help him solve the problem. If he needs repair, we've never hung anybody up for a Friday night gig, our turnaround time on service is *very* fast.

What is the extent of your advertising and promotion on the store?

Levin: We have run one ad in *Guitar Player* and that's it. We have never really done any advertising. Most of our promotion is word-of-mouth, we ran the ad just to see what was doin', a



visibility thing. Without that ad we still do business all over the country, in fact, all over the world. We get orders from the Carolinas, Florida, Los Angeles. We have got people who drive up from Tennessee two or three times a week. It's all word-of-mouth. If you do something right, people are going to know it. If you do something wrong, they're going to find out a lot *faster!* Word-of-mouth is the best advertising you can get. Return business, a totally satisfied customer. It's certainly not the easiest form of advertising, cause you have to *work* to keep those people happy. One can run ads and say, "So-and-so shops here, they love us, they think we're great." I don't think that type of thing works any more. If someone knows that you're busting your ass for him, then you've made the right impression. It's not that hard to be nice and reasonable with someone. People generally shop price and ser-

vice, that's what we offer at Music Center. My customers are my main concern.

Do you service a lot of professional-artists?

Levin: Just about anyone who comes through Washington, D.C. If there is a need for anything we are the ones usually called in the Washington area. We work closely with the Cellar Door promoters in the city, Stevie Wonder was in not too long ago and bought some stuff. Nils Lofgren is from this area and he does a *lot* of business with us. Jefferson Starship has some stuff going out now to them from our outlet.

Do you do any equipment rental at Music Center?

Levin: Some, we rent gear to some of the concert companies in Washington, that's as far as it goes. It's done not to make money, but to keep things rolling. That is, if they need





something, they send people to us. If they need equipment or service, we take care of it. You know we get calls a half hour before the show that something has crapped out, they'll send somebody up and we'll have it ready by the time they get here. If they need a repairman we can line somebody up for them.

Do you do any mail order or catalog business?

Levin: We mail a lot of stuff out, but they are basically phone orders. We don't have any catalogs. In fact I think everybody is going to be coming down on them pretty soon. It's a very easy business to be in, the catalog/mail order business, because you never see the customer again. When we get a

phone order, *they* are calling *us* for something. It's not like I went out and found them. It's not really a healthy angle to this business.

Do you hold educational clinics or seminars at Music Center?

Levin: For our salesmen, the companies will send in reps to educate us to the new lines of products and their uses. We really don't have the time to have clinics in the store. We just had Yamaha in the store a few weeks ago, on a Saturday, showing their line of keyboards. On any given Saturday we'll have 75 to 100 customers in the store, and if we held a seminar, that would be another 100 or 150 people in the place. There goes business! Sometimes you can arrange for



something of this nature for a separate location, at a hotel or someplace like that. If your store is empty and you want to bring in people that's fine, but other than that it can get in the way. We, as a staff, have sales meetings every two weeks and on occasion we'll have the synthesizer people in, or the guitar guys will come in to demonstrate something new. We do these things in the morning when it is really convenient. For our sales staff the seminars are important because you can unsell as fast as sell. So it's important to know what you're talking about.

How do you find good sales people and form an efficient staff?

Levin: We have a very low turnover in our employee ranks and we have a very good crew. Anytime you deal with a lot of people together you're going to have snags come up every once in a while, but our crew is very together. We have over 40 people working for us and we have about ten men working the floor. Our working atmosphere is pretty easy going. I sweep the floor, my dad will unload the truck. Nobody is expected to do something nobody else does, everybody does a little of everything. We give our employees a lot of leeway. We realize they have to do, *what* they have to do. There is no pressure for them to hit any sales numbers, they know when they're having a good or bad month. The sales people are on a commission and salary payment basis, so that makes it comfortable yet still offers incentive rewards.

How do you handle customer demonstrations? There must be some high-end audio gear you don't want them just fooling around with. How do you control this situation?

Levin: The customer has to be with a salesman. Anybody can try anything in our store. But to just come in and jam or hangout or spend five hours there—you have to draw the line somewhere. If someone comes in and wants to look at, say, Alembic basses and he honestly wants to try one out, there is no snag. We let him try it, we don't want him to make a profession of it. Everyone who comes in the store is a potential customer, and you just can't say "No" to everybody. You can't categorize them as they walk through the door. Just because somebody

doesn't have on a suit and tie, doesn't mean he's not ready to spend his good money on equipment.

Do you have any other outlets?

Levin: No! This is all we can handle! It's basically my father, my mother, and I, and it's got our name on it. You're dealing with more than a *business*, you're dealing with *our* name. If something goes wrong with a customer, they're not going to say that it was the salesman who gave them a bad time. They are going to say it was Chuck Levin's Washington Music Center. It's a matter of pride. If I had another place and I had somebody else taking care of our name . . . well forget it, it doesn't work out.

You have such a large inventory. How do you determine what you're going to stock.

Levin: If the manufacturer sends us a new piece of gear we'll put it on the bench to test it and we'll put it out on the floor where it can be used and we see how it holds up. We are offered just about everything that comes out on the market, after all it's a good outlet for their gear to be in. What we try to do is to get the best in each category,



we try to have at least one of everything that is made. But if an item doesn't have anything to offer and we feel that it's not that valuable to the end user, then we would rather not have it around. It's better to have a few less lines and do a knockout business with that. With every line we deal with we're in the top 10 in sales

figures and in *most* cases in the top 5 with every major company that there is. But to have all those lines just to have them isn't wise when something has an advantage over another product. But another point is; what doesn't sell here will sell somewhere else.



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INDUSTRY UPDATE

Joel Cohen, President of Sound Concepts, Inc., announced the appointment of Howard Jacks as Sales and Technical Training Director. Sound Concepts manufacturers time delay devices.

* * * *

Robert Coppola has been named Executive Vice President of KLH Research and Development Corp., Coppola will be responsible for daily marketing operations, and will also direct expansion within the international market for KLH and Burwen Research. For the past 10 years the 36 year old Coppola has been president and owner of Phonopol, a West German representative firm. For

five years he handled KLH and is credited with establishing the speaker company abroad. His ability to sell audio products is greatly enhanced by his musical knowledge, having attended Manhattan School of Music and the Conservatory of Music in Wurzburg, West Germany. In another KLH/Burwen announcement Timothy W. Halchuck was named Vice President of Acoustical Engineering. Having worked his way up from the production line through several functions in several departments, Halchuck has an intimate knowledge of the company's products and product goals. The following were named new sales reps for KLH/Burwen Research:

Memphis-based Leathers and Associates for Tennessee, Mississippi, and Alabama; Marketing Sales Division of El Rep in Tucker, Georgia for North Carolina, South Carolina, and Georgia; Dallas based Al Moskau and Associates for Oklahoma, Louisiana, and Texas—excluding El Paso.

* * * *

The first NAMM Retail Operations Institute (ROI) will be held April 2-4 at the University of Chicago's Center for Continuing Education. The two day institute is designed exclusively for store managers, branch managers, and those owner-principals directly involved in the daily management of their businesses. The Retail Opera-

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tions Institute is an off-shoot of the August NAMM Management Institute, which is devoted solely to the ownership function in the retail music business. The April institute will concentrate on three areas of business education; Supervisions and Delegation, Inventory Management and Turnover, and Developing a Game Strategy for Merchandising. Registration for the institute is limited to 100, and no more than two employees from any one store will be allowed to enroll. The registration fee for NAMM member stores is \$175.00 per person, which includes airport transfers, tuition, room and board, and instructional materials. The all-inclusive fee for non-member stores is \$225.00 per person. For further information write or call NAMM Member Services Department, Suite 3320, 35 E. Wacker Dr., Chicago, IL 60601.

* * * *

In keeping with a well-established tradition of training dealers and informing the buying public of the results of its research and development, ARP Instruments has had Bill Singer, their product specialist, out on the road giving seminars and demonstrations of the ARP Avatar Guitar Synthesizer. Regional Avatar training sessions, designed to upgrade dealer product knowledge, are currently in process throughout the United States. On the calendar for this spring are additional intensive synthesizer training sessions for dealers which will be conducted by both Mr. Singer and Mike Brigida, ARP keyboard product specialist.

* * * *

William L. Fowler, Vice President and General Manager of Altec Lansing International, has announced the appointment of Curtis Pickelle to the position of Marketing Communications Manager, replacing Deryl Finney who accepted a similar position with a large computer manufacturer. Pickelle will be responsible for Altec Lansing's advertising, public relations, trade show and other communications efforts, and heading the firm's in-house advertising agency. He will also remain the company's spokesman for the trade and consumer press and will maintain his direct involvement in press relations, and press conferences.

* * * *

BAM, the California music magazine, has introduced "The Mix," the first comprehensive directory of

over 150 recording studios and services in Southern California. "The Mix" will feature complete and detailed descriptions of studio information, feature articles by such notables as Wally Heider and Brian Cornfield, and a full-sized map locating studios in Southern California. For further information write: The Mix, PO Box 6395, Berkeley, CA 94607.

* * * *

Robert Bowman, Vice President and Sales Manager of Tandberg of America, Inc., announced the appointment of Theodore Pappas and Associates Inc., 5218 W. Diversey Ave., Chicago, IL 60639, as Sales Representatives for Illinois, Wisconsin, Indiana, and Kentucky.

* * * *

Anvil Cases has announced the appointment of Ralph G. Hoopes to the position of General Sales Manager. Reporting to W. Wayne Thompson, President, Mr. Hoopes will be responsible for activities of the in-house sales staff and general sales activity in Los Angeles and Orange counties, in California. Additional responsibilities of Mr. Hoopes include research and assistance in new market penetration and promotion program development.

He brings to Anvil extensive retail and wholesale management experience. Bob Baldwin, who joined Anvil in September of 1976, continues his duties as National Sales Manager. He will coordinate the activities of the 16 sales firms representing Anvil Cases throughout the country.

* * * *

Crown International announced that its new 70" walnut veneer display cabinet is now available for dealer display purposes as well as the appointment of Terry E. Frick as Quality Control Manager. Mr. Frick will be responsible for coordinating all quality assurance programs for this manufacturer of high-end audio electronics. Programs under his direction include; incoming inspection, production line quality assurance, dealer and customer receipt quality levels, coordination of data on field problems, and warranty service information for product quality improvement. Terry is a graduate of Purdue University and Golden Gate University in San Francisco. He came to the Indiana firm last year from the Ampex Corporation in California where he was employed for 12 years.



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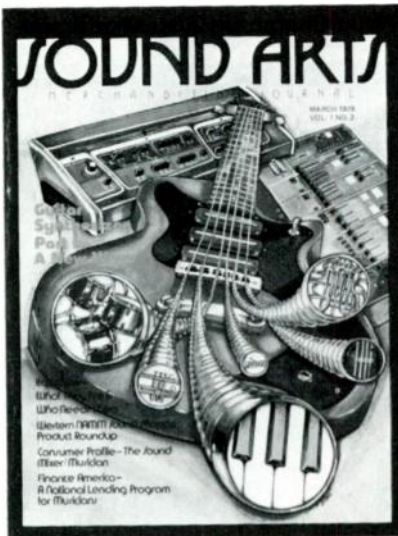
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Advertiser's Index

RS #	Advertiser	Page #
93	Altec Lansing Intl. 1515 South Manchester Ave. Anaheim, Calif. 92803	13
95	ARP Instruments 45 Hartwell Ave. Lexington, Mass. 02173	41
89	Audio Marketing 142 Hamilton Ave. Stamford, Conn. 06902	40
98	Audio Technica 33 Shiawasse Ave. Fairlawn, Ohio	37
97	BGW 13130 S. Yukon Hawthorne, Calif. 90250	11
94	Blamp Systems Inc. 10950 SW 5th Ave. Beaverton, Ore. 97005	21
92	DBX 71 Chapel St. Newton, Mass. 02195	7
84	DiMarzio Instr. Pickups 643 Bay St. Staten Island, N.Y. 10304	Back Cover
88	Ibanez (Div. Elger Co.) 1716 Winchester Rd. Cornwell Heights, Pa. 19020	38
91	Infitheatre 4990 Massachusetts Ave. Indianapolis, IN 46218	30
87	JBL—Pro Division 8500 Balboa Blvd. Northridge, Calif. 91329	19
86	Keas 210 W. Main St. Chanute, Kansas 66720	48
83	MXR Innovations 247 N. Goodman St. Rochester, N.Y. 14607	39
96	Peavey Electronics P.O. Box 2898 Meridian, Miss. 39301	31
No #	Sound Workshop 1040 Northern Blvd. Roslyn, N.Y. 11576	4
82	Uni-Sync 742 Hampshire Rd. Westlake Village, Calif. 91361	3
85	Whirlwind Music 100 Boxart St. Rochester, N.Y. 14612	47
90	White Instruments P.O. Box 698 Austin, Tex. 78767	49
99	Yamaha International 6600 Orangethorpe Buena Park, Calif. 90620	inside front cover

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