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JUNE 1978

VOLUME 10 — NUMBER 3

INCLUDING: CONCERT SOUND REINFORCEMENT

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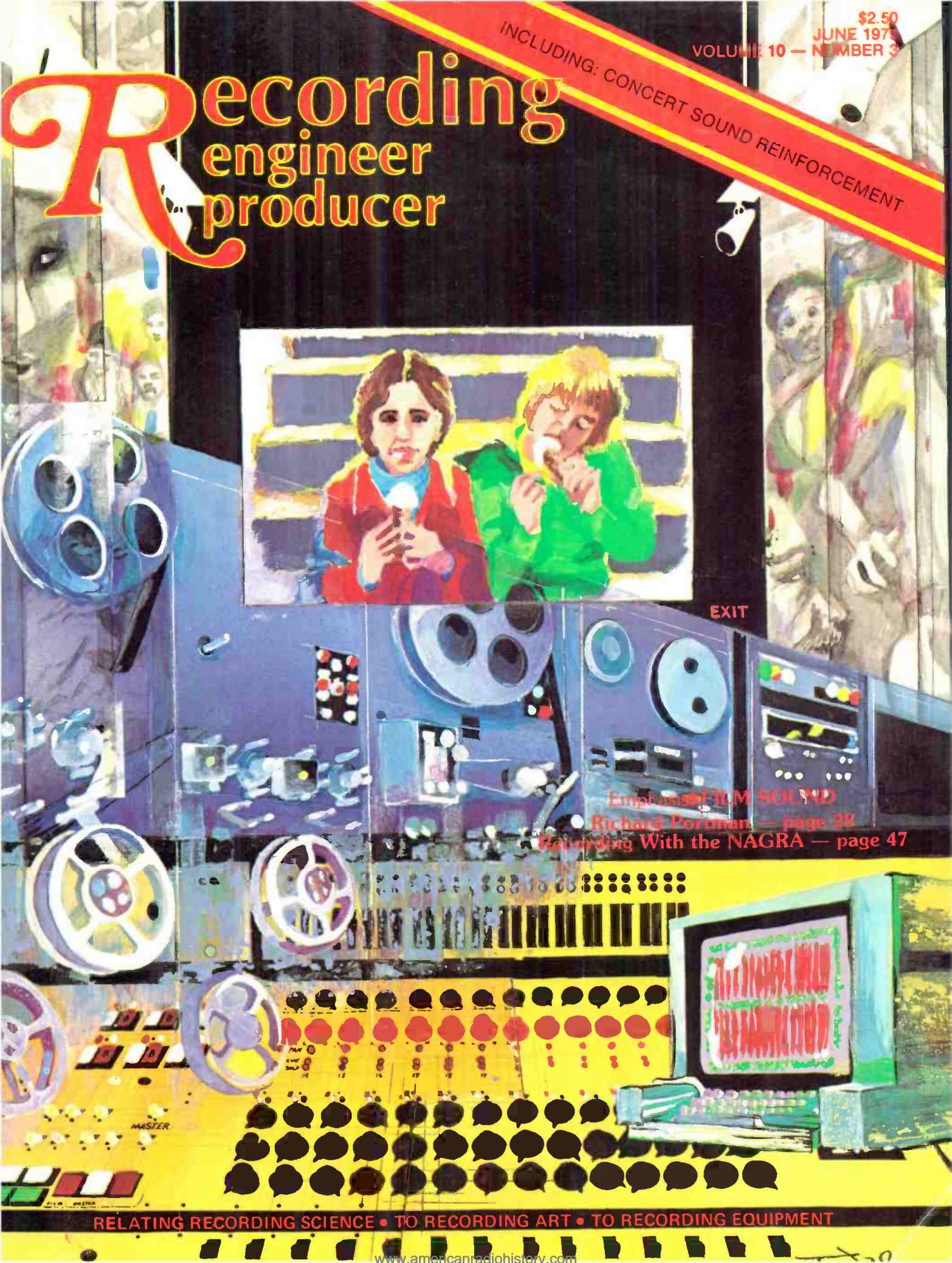


EXIT

Emphasis on SOUND


Richard Portman — page 28

Working With the NAGRA — page 47




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


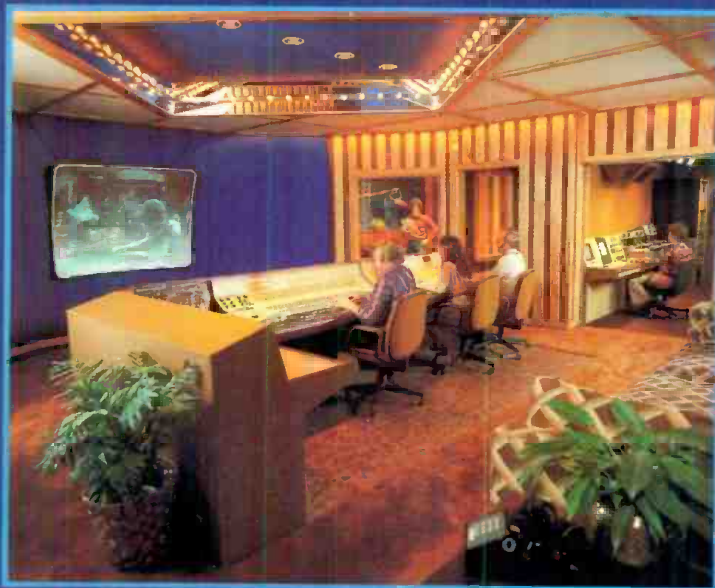
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— the magazine to exclusively serve the Recording Studio market . . . all those whose work involves the recording of commercially marketable sound.

— the magazine produced to relate . . . Recording ART to Recording SCIENCE to Recording EQUIPMENT.



Editor/Publisher MARTIN GALLAY
Managing Editor TOM LUBIN
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Operations Manager . D. KEITH LARKIN
Business Manager V. L. GAFFNEY
Circulation Manager PATTY COLLINS



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Artist Trici Venola's acrylic impressions of film producer Robert Altman's Lion's Gate Sound during Tom Lubin's interview with Richard Portman.

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LATE, LATE, LATE NEWS

SOCIETY OF PROFESSIONAL AUDIO RECORDING STUDIOS FORMED

A group of the leading recording studio owners in America gathered June 15th in Ft. Lauderdale, Florida, to form a professional society for Recording Studios. The organization will be dedicated to achieve excellence in the craft, suggest professional standards, and to provide a forum for statements on technical matters affecting the industry.

Caretaker officers were elected to serve until industry-wide elections are held. Chairman of the Board, representing the studio industry at large, is Joe Tarsia, of Philadelphia. Regional members of the board are Bob Liftin, New York; Chris Stone, Los Angeles; Mack Emerman, Miami; Glenn Snoddy, Nashville.

Founding companies who created the Society are the following studios: A&R Recording Studios, New York City; Atlantic Studios, New York City; Criteria Recording Company, Miami; Filmways Heider Recording, Hollywood; Group IV Recording Studios, Hollywood; House of Music, New Jersey; Howard M. Schwartz Recording, Inc., New York City; Kendun Recorders, Inc., Burbank; Larrabee Sound, Hollywood; Media Sound, New York City; Record Plant, Los Angeles; Regent Sound Studios, Philadelphia; Soundmixers, Inc., New York City; Studio 55, Los Angeles and Woodland Sound Studios, Nashville.

Membership by studios in the Audio Recording Industry is invited. The Board of Directors will review applications to the Society. Applications should be directed to Kent R. Duncan, care of Kendun Recorders, 619 S. Glenwood Place, Burbank, California 91506. Additional information can be obtained from Dave Teig, at Atlantic Studios in New York City, or any of the regional directors. For information, contact Kent Duncan, (213) 843-8115, or Dave Teig, (212) 484-8490.

MCI/EMI LICENSING AGREEMENT FOR DIGITAL TAPE EQUIPMENT

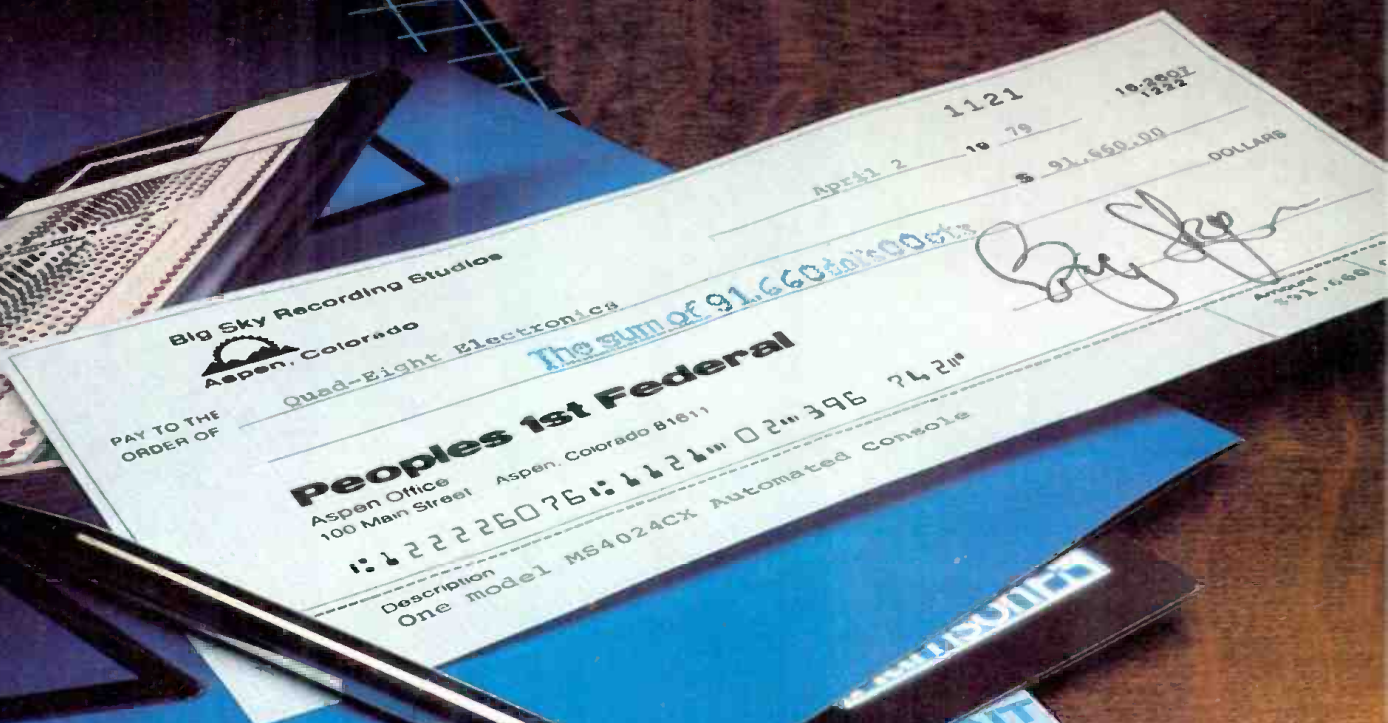
MCI, Inc., and EMI, Ltd., have entered into a licensing agreement under which MCI will manufacture digital tape recording equipment, based on technology developed by EMI. A prototype of the first machine to be developed under the agreement — the MCI JH-220 — two channel stereo tape recorder, was shown at the Association of Professional Recording Studios Exhibition in London.

The production models of the JH-220 will be available by the end of this year. The first of these will go into EMI recording studios and be immediately available to artists using those studios.

Future joint projects under the licensing agreement will include future development of an editing system as well as multichannel digital tape recorders.

Development work on both these projects is nearing completion at EMI's central research laboratories at Hages in Middlesex, England, and prototypes of both will be completed by MCI by the end of this year, and will go into production early in 1980.

Wait till the Word gets out.



for additional information circle no. 1

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Picture shows one of three studios at Motown Recording Studios—Los Angeles equipped with the ultimate 8078 console and the NECAM Computer Assisted Mixing.

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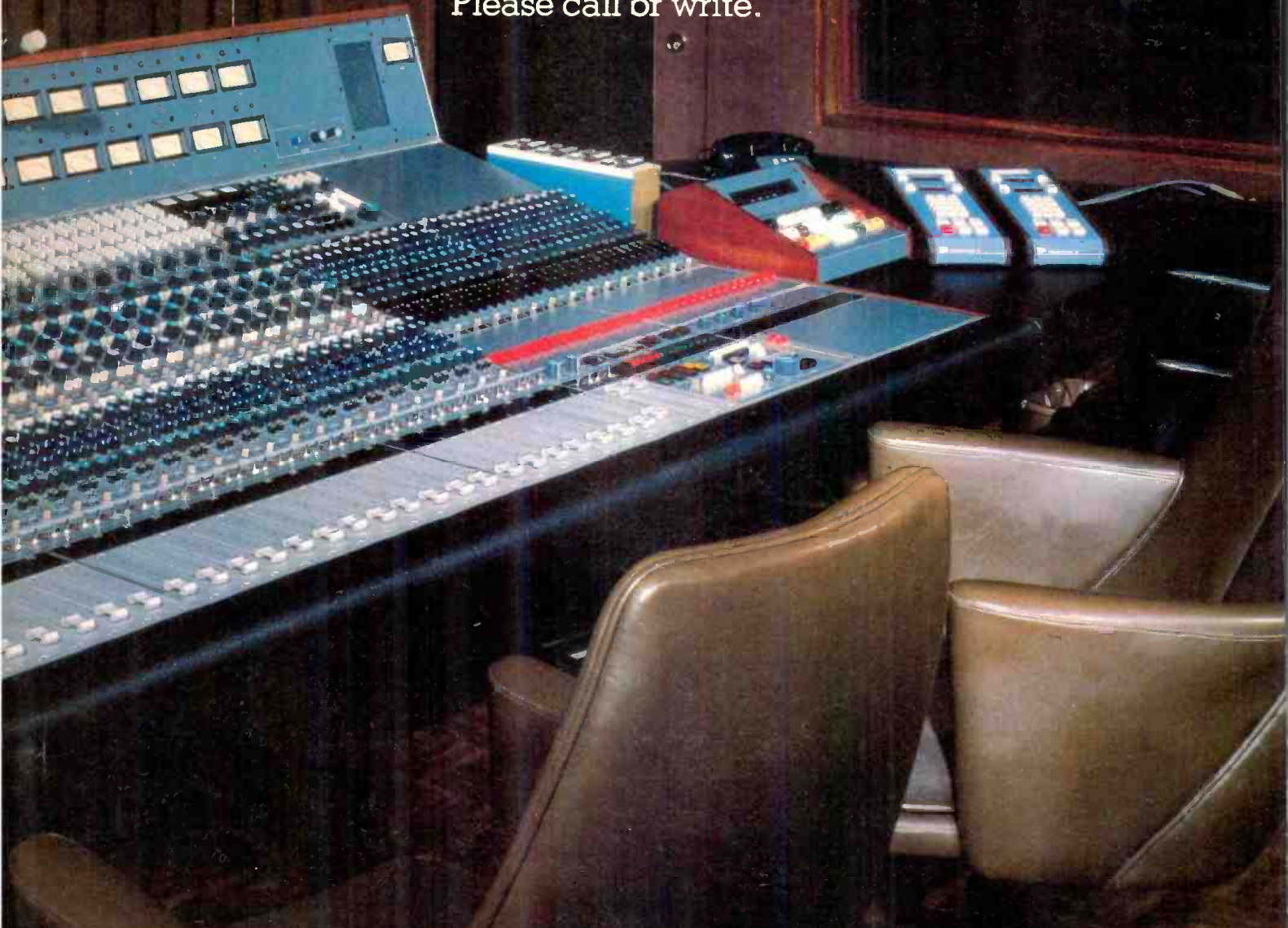
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Letters

from: **Michael Rettinger**
Consultant on Acoustics
Encino, CA

On page 78 of your April 1979 issue, in an article by Kent Duncan entitled *Studio Design Requirements for the Next Decade*, there appears the following statement: "If a monitor is placed in a free field and sufficient power is fed to deliver, say 110 dB SPL broadband, and a second identical monitor is fed an equal amount of power, theoretically a 6 dB power increase will result acoustically."

The above statement represents an impossibility even when modified to the extent that the two monitors are placed side-by-side and not opposite each other. Two identical sound sources radiate double the acoustic power of one, and twice the power of any quantity, electrical or acoustical, results in only a 3 dB increase in the power level. For a broadband signal, not even the sound pressure level can increase 6 dB for twice the sound power output.

reply from:

Kent R. Duncan
Founder and President
Sierra Audio, California

It is not my intention to debate the definition of a free field. Suffice it to say that in discussing power additive conditions in our control rooms which were designed to be acoustically two-dimensional by virtue of porting to the trap cavities we have completed five recording studios with a full 6 dB add, broadband. These measurements were done in the method specified in my article and mid-band decay time in all five of these rooms was under .35 seconds at 40 Hz and .25 seconds at 3100 Hz. Examples of these five rooms are the Union Studios, in Munich, Germany, where reverb time in the mid-band was .25 seconds released January, 1978, and CBS/Sony Studio 1 released in September, 1978 where mid-band decay time was .27.

It has been our experience over the years in trying to achieve this exclusive 6 dB add condition that as mid-band decay time increased, which is to say reverberant field was increased the add condition would be reduced as phase cancellation would occur due to the reverberation. This is the reason that only in special instances have we allowed the rear of the room to be treated with live, low absorption coefficient materials as power additive condition is reduced by a room which is treated live in the back end.

This discussion is of great interest and

runs parallel to the one where console manufacturers are forced to decide whether pan pots should have a 3 dB rise when centered or a 6 dB rise. Our research into power add of any two monitors in the control room was launched when mixers began describing the different apparent level of the vocalist mixed to center in various control rooms where they worked. The reason that we do not recommend control rooms that are too live is that they exhibit poor additive condition and therefore cause mixers to balance instruments panned to the center too far up in the mix, thereby decreasing stereo separation of the program material.

While we are still learning this field, I submit that a room measuring a 3 dB power add is far behind the state-of-the-art. We have measured two rooms where out-of-phase material was so random due to lack of bass control and hard surfaces creating reverberant patterns resultant in a zero dB add . . .

Since we feel a reverberant field out of control causes reduction of additive power, we can only state that Mr. Rettinger should visit a recent room to experience and measure this 6 dB add condition. In the last 100 studios we have not had a single room with less than a 5.5 dB sum-add and five rooms have exhibited a full 6 dB. A great majority of the rooms that were 5.5 dB exhibited up through 6300 Hz and then dropped back in the top end.

Further, I refer you to the letter to the editor by Mr. Tom Hidley in this issue for additional information.

from: **Tom Hidley**
Acoustic Consultant to:
Sierra Audio, California
Eastlake Audio, Switzerland

My article discussing variability of decay time in control rooms as an adjunct to Kent Duncan's thorough article on acoustics is not yet complete. The intense pressure from European customers in addition to twenty-six rooms sold by Sierra Audio in the last 60 days have produced an unprecedented backlog for our design services.

I hope you and your readers will accept my apology as I look forward to discussing some new live control rooms we have built over the past three years in Europe, particularly now that American studios and designers are following suit with more control room variation.

As early as 1975 in Switzerland, and again in a 1977 Swedish project, we designed and

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Compare Tangent's features to consoles costing twice as much and you'll see what a value Tangent is.

As for comparing Tangent's quality, well, you just can't get better than the original.

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R-e/p 13

constructed control rooms which featured live characteristics (accomplished by surface materials with lower absorption coefficients).

At the time, we were not aware that this approach was a technological revolution in control rooms, but merely a demonstration of the flexibility of our design. In the space occupied by the average control room, we have built rooms varying up through .4 seconds at 3100 Hz, throughout the guarantee area measuring 2 meters by 5 meters (centered on the mixing position).

If your acoustician cannot provide you with an acoustic guarantee and specific decay times by frequency (as we offer to do) before job start, then you should consider what our experience can do for you.

The character of a control room is the sum of direct and random field signal, and defined in the reverberation times measured in the room. We suggest, based upon our customer feedback from 216 clients, the following decay times: .3 - .35 @ 40 Hz; .25 - .28 @ 160 Hz and .25 from 250 Hz up.

This will deliver tight bass, and well defined mid and top. From this basis it is a simple matter to achieve longer mid-band decay times by altering finish materials for desired effect.

This approach, as we mentioned earlier is by no means new. As we have designed rooms with more variability over the years we deemed it unnecessary to trumpet this relatively minor variation. As a matter of fact, theaters for decades have been designed around this concept, with drapes at the stage and front walls for deadening and a hard back wall for brightening. In our recent renovation of the London Palladium we used these factors to optimize the concert hall's acoustical performance. No mystery, no new magic, just experience.

Over the years, our studios have been the scene of literally thousands of gold and platinum records, and let's face it, we're in the music business, and hit records are what it's all about.

When Eric Stewart of 10 cc asked us to do his famous Strawberry Studios over, he mentioned that his secretary had called all the producers of top 100 hit records in England of a particular week. Of the people she was able to contact, some seventy per cent had worked in a room of our design. Since that initial room, we have done two more Strawberry Studios.

Having the advantage of building rooms for the specific needs of such diverse artists as Stevie Wonder, Quincy Jones, Tony Clarke, ABBA, Deep Purple, Jethro Tull, Anita Kerr and such noted facilities as Kendun Recorders, The Record Plant, Warner Brothers, Artisan Sound, The Manor, PYE, CBS/Sony, DJM Records, Soundmixers, Stone Castle Studios and over 200 others has given us invaluable experience and input to service new

customers. One of the most fulfilling accomplishments of my career is that to my knowledge, not a single Tom Hidley design client has had a business failure. That is remarkable in any industry, but in the music business that track record coupled with the hits from our clients indicate the engineer's tool we call a Sierra/Hidley studio is one proven by artistic achievement.

from: **Neil A. Muncy**
Systems Consultant
Sonority Recording Company
Rockville, MD

I have been following the comments of Mr. Ray Kimber on the subject of loudspeaker wire and damping factor importance with considerable interest since it happens to coincide with several current projects of mine.

By way of adding some additional input to the discussion, I would like to offer the following:

A loudspeaker being driven by a power amplifier acts, as Mr. Kimber points out in your February, 1979 issue, as a generator of some significance during the time that your cone is returning to "ground zero" from an excursion in either direction. The power amplifier driving the speaker may exert some "braking" force on the speaker if its damping factor is sufficiently high, and, if it gets a fair shot at the problem. One way to significantly reduce the potential damping factor of a power amplifier is to place a resistance in series with its output and the speaker.

Series resistance of any significance compared to the impedance of the speaker has the first effect of gobbling up the power that would otherwise be available at the terminals of the speaker itself. This is a pretty expensive way to heat your room! The more serious effect of any series resistance is to really zap the damping factor. The damping factor is "created" by the ability of the amplifier to sense an error signal at its output terminals and zip it back to its inverting input (feedback), whereupon it re-appears at the output of the amplifier with the opposite sign (polarity) but equal amplitude (almost equal, that is). The higher the damping factor, the better this phenomenon gets. Now, theoretically, if a generator (the voice coil) were to be presented with a signal that was exactly opposite in polarity but equal in amplitude, the generator would "think" that it was looking into a very low impedance load, would immediately slow down (due to loading) to the degree that corresponds to what the amplifier "wants" it to, and would therefore produce a sound wave which was theoretically identical to the electrical wave which got the whole mess started in the first place.

Now for the sticky wicket department.

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Take a power amplifier with a damping factor of 100. If the amplifier is rated to operate into an 8-ohm load, then the effective output impedance of the amplifier would be 8:100, or 0.08 ohms. Suppose that you have 2 ohms worth of wire between this amplifier and the speaker. This 2 ohms of wire resistance forms the series leg of a voltage divider as far as the voltage generated by the speaker is concerned. The *shunt* leg of the voltage divider is the output impedance of the power amplifier. Taking our typical amplifiers' output impedance of 0.08 ohms, we have a voltage divider of roughly 28 dB "loss" *between* the speaker terminals and the amplifier! The amplifier will only develop a corrective damping signal equal to the *voltage* applied to its output. A corrective signal 28 dB lower than the error signal generated by the speaker in the first place isn't going to do any real good. Taking the wire resistance down to where it *equals* the output impedance of the amplifier still results in the error signal delivered to the amplifiers' output by the speaker being only 1/2 of what the speaker generated. Now I'm not trying to say or imply that the only way to make things really work right is to use welding cable for speaker wire, but I do think that, where warranted, the use of heavy speaker wire will certainly assist in the task of reducing the cumulative degradation of sound fidelity in the reproducing chain.

At the risk of raising the hackles of the loudspeaker designers amongst your readers, let me drop another thought or two on the subject. Any multiple-driver loudspeaker system which employs passive crossovers (as opposed to a bi-amped, or n-amped system) is in trouble as regards the real effect of amplifier damping on the drivers. At frequencies near the crossover points, but within the passband for any given driver, the effective source impedance that the speaker "sees" is going to be a lot higher than the output impedance of the power amplifier. This is not exactly what would be desired if we could have our "druthers." The one place where the damping factor *ought* to be high if you want to get picky is in the critical crossover region. Could this be yet another example of the devilish doings of Mr. Murphy? Bi-amping, tri-amping, or n-amping a loudspeaker system is expensive. However, if the damping factor concept is really valid (I certainly think so), and you want to really go after that elusive "better" sound, getting rid of the passive crossover is a valuable alternative if you have the bucks.

Our colleagues in the power supply biz came up with a cute little trick a number of years ago which I haven't seen in any commercial amplifier as yet. They use a separate feedback input to the regulator section, connected by a third wire directly to

the load. The purpose of this extra input is to give the supply an idea of what is going on out there in "load land." Howzabout somebody in the power amplifier designing business taking a look at that technique with the thought of enhancing the *effective* damping factor of the amplifier-speaker combination?

Many of your readers have no doubt been exposed to the really impressive improvement in reproduction afforded by the UREI 813 "Time Aligned" monitor system. I have a feeling that an even better speaker system could be realized by eliminating the passive network, tri-amping the system, and "Time Aligning" by means of active circuitry. I'm looking forward to the day when someone does it. Multi-amping a loudspeaker system has another hidden advantage, namely, that lower-power amplifiers may be used, thereby significantly reducing the possibility of roasting a high-frequency driver when someone rewinds a tape and Mr. Murphy causes the tape lifters to fail!

I am in the process of compiling a collection of the various corollaries to Murphy's Law. Perhaps it might make interesting reading?

reply from:

Ray Kimber

I would like to thank Mr. Muncy for turning the damping factor consideration to

The Sound Workshop Series 1600 recording console.

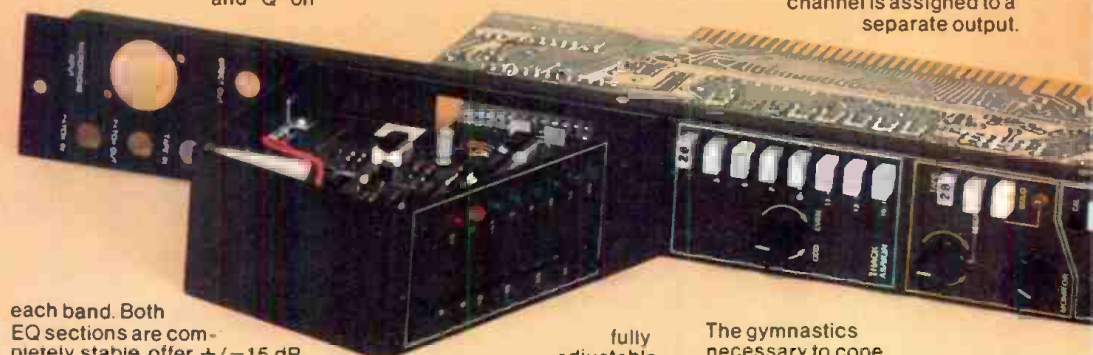
As technology advances at an ever increasing rate, it has become easier to design and build recording equipment that yields "professional" specifications. But specifications alone do not define a product. As we conceived the Series 1600, we saw the need for a "true" professional console that would be at home in major multi-track installations, yet offer the cost effectiveness that other manufacturers promise.

The Sound Workshop Series 1600 employs a modular design philosophy, allowing numerous initial configurations, and the ability to add features and function as need dictates and cash flow allows.

The Series 1600 is available with our standard transformer coupled mic-pre or our new transformerless design which features the TRANS-AMP LZ* amplifier module.

Two equalizers are offered: the standard 3-Band 12-Frequency:

and the optional full parametric which offers complete control of frequency, boost/cut, and "Q" on



each band. Both EQ sections are completely stable, offer +/- 15 dB range, and include an 18 dB/octave switchable low-cut filter as well as LED status indication for EQ IN and LOW-CUT IN.

The standard level indicator is an LED column which can be ordered with or later retro-fitted with Peak reading capabilities. Our new High Resolution Meter Module offers the convenience of

LED metering with even greater resolution than standard meters. All of our LED indicators feature

fully adjustable intensity to compensate for ambient light conditions, and accept our Spectrum Analyzer which adds Real-Time Analyzation to the Series 1600. Standard Vu Meters are available on special order.

Our VCA Grouping Package permits assignment of each input channel to up to 3 Input Sub-

groups allowing from two inputs to the entire console to be controlled by one fader, even if each channel is assigned to a separate output.

The gymnastics necessary to cope with today's complex mixes are handled by ARMS Automation, leaving the engineer and producer to return to their art; music and creativity. ARMS is a true computer based system featuring INDEPENDENT MUTE WRITE (if you are considering other automation systems, don't buy one that can't write mutes independently!!!!), Auto-nulling,

*Registered trademark of the Valley People, Inc., Nashville, Tennessee.

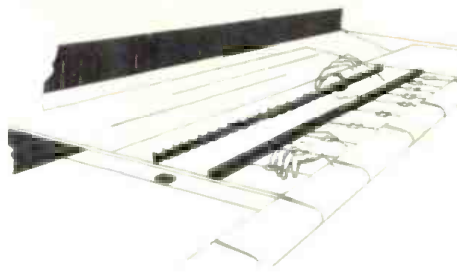
a new angle, and for sharing his observations of this vantage point. I have a sneaky feeling that this has some substance.

I certainly agree with his view on passive crossovers. I think they are a problem area, and the source of much distortion. Besides I have found that bi-amped, tri-amped, and quad-amped systems can be economically obtained.

I have a hunch that the idea of putting of 'sensing' circuit by means of a third wire back to the amplifier would not be wildly productive for the following reasons: 1) The lead would have to be shielded to prevent outside interference from contributing to the correcting signal. A shielded wire would not be needed in a power supply since only DC levels are considered in the power supply, but in the case of a power amplifier the signal would be as complex as the signal, and that my friends is complex. 2) The additional cost of the re-design or new design of an amplifier coupled with the cost of the separate lead would likely exceed the cost of heavier speaker cable.

However, it is a very interesting idea, and is already used at least in spirit by Philips in their Motional Feedback speaker systems.

In some cases Murphy's Laws do not cover sufficiently, that is why I subscribe to "O'Shea's Law" which states: "Murphy was an optimist."



AUTOMATED MUTING

from: **Doug Parry**
Smoketree Ranch Studios
Chatsworth, California

It has been some years since I read the first article about automated mixing. In the beginning most of the information was the usual manufacturers battleground of who is better than who. Each builder claiming that his system was better, more efficient, easier to operate, or more reliable. The participants in those early debates have gone on to build some very fine consoles each of which has its own automation idiosyncrasies. Which board is best comes down to personal preference and the economics of the specific situation. What has become relevant to a mixer who uses the boards is not which board is best, since they are all very good, but how functionally different is one board from another, how do their programs vary. Most conventional

boards are functionally similar to the degree that a competent mixer can move from one board to another without too much problem. The automated boards on the other hand are so elaborate and sophisticated that a mixer who is comfortable and familiar with one design often finds himself in an awkward position when he's confronted with another band at some other studio.

I have an automated MCI-528 board. I originally built the studio for my own work, and have made it available to a few outside clients. I have been able to experiment with it quite a lot and have been able to watch a number of guest engineers using it. In the course of using the board I've learned quite a lot about the automation. I think a few of the things I do with it could be applied to other systems. Regardless of which system is used, automation has many clear and definite advantages. I feel it can save the client money as well as make the mix session a more creative endeavor.

It's been my experience that the idea of doing a mix and recovering it in its entirety at some future date is a bit far fetched, since mixing is so subjective and dependent on the mood of the moment. It's unlikely that the feeling and spontaneity that you have for the re-mix will be the same as those you had

continued on page 131 . . .

A new philosophy of console design.

computer controlled Entry and Exit modes, programmable muting, in-place- solo and more. ARMS will accept our soon to be released Super-Group option which allows an UNLIMITED number of programmable input subgroups.

Almost all of the options available for the Series 1600 can be retrofitted with no additional expense over the cost if factory installed. Write for additional details. We're choosy about who sells the Series 1600, so if you need assistance in finding the right dealer, call Emil Handke, here at Sound Workshop (516-582-6210).

The Series 1600 also features Penny & Giles faders; fully balanced inputs, transformers coupled track outputs, independent Studio and Control Room sections, 4 send buses with Input-sourcing and output assignment; and our unique modular, balanced TT Patch Bay.

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 Sound Workshop

Sound Workshop Professional Audio Products, Inc.
 1324 Motor Parkway, Hauppauge, New York 11787 (516) 582-6210

STUDIO UPDATE

Northeast:

□ **JOHN HILL**, composer, producer and president of **HOT SHOT PRODUCTIONS**, has revealed that **DUNE RECORDING**, a full service recording studio he has constructed in Eastham, Massachusetts, will be "open for business" early in August.

Halfway between Provincetown and Hyannis on Cape Cod, and the first facility of its kind in the area, Dune Recording is presently 16 track with Autotech recorder and custom console. The studio is also fully equipped with several synthesizers and a Digital Group Z-80 based computer to control them.

Hill's ultimate intention is to expand Dune to a state-of-the-art 24 track "total environment" complex with facilities for lodging.

□ **SIGMA SOUND STUDIOS** is pursuing a rapid growth trend in both Philadelphia and New York, opening additional facilities in both cities within the next year. In the meantime, Casablanca's **WEST SIDE STRUTTERS** and **LIQUID GOLD** are recording in the New York studio with producer **JOE LONG** and engineer **STEVE TOSE**. **SIGMA SOUND** has been the permanent recording home of **THE VILLAGE PEOPLE**, **JIM BURGESS** and **JACQUES MORALI**. Morali is currently working on the new **RITCHIE FAMILY** album with engineers **MIKE HUTCHINSON** and **ANDY ABRAMS**.

□ At **BLUE ROCK STUDIO**, **RAY DAVIES** is producing **THE KINKS** in their first U.S.A. recording for **ARISTA**. Engineering is by **JOHN ROLLO**. Producer **STEPHAN GALFAS** has completed the recording of **PHILLIP D'ARROW'S** "Burn the Disco Down," at Blue Rock for **POLYDOR**. Reunited at Blue Rock: **ALAN GORDON**, **GARY BONNER** and **JAKE JACOBS** formerly of **THE MAGICIANS**, doing some new tunes. Engineering by **MICHAEL EWASKO**.

□ **THE ROBERT KLEIN HOUR**, featuring **ROBIN WILLIAMS** of **MORK AND MINDY**, was recently recorded at **NOLA RECORDING STUDIOS**. Also guesting were **GENE SIMMONS** and **ACE FEHELEY**, of **KISS**. 111 West 57th Street, New York, NY 10019. (212) 586-0040.

□ **AUDIO INTERNATIONAL (N.J.)** announces the acquisition of **MASTERTONE RECORDING STUDIOS**, in New York City, as the first stage of its planned expansion. **WARREN C. SLATEN**, president, indicated that both firms would remain as separate entities, with Audio International providing equipment sales and installation, and "on-call" maintenance staff service to pro/semi-pro audio facilities, and, Mastertone, one of New York's longest established studios, will continue to provide professional recording services, including a large 16 track studio, editing/mixing rooms, a production studio, computerized record cutting facilities, with direct-to-disk capabilities and a newly added "self-service" Tascam studio, an area first.

□ Under the supervision of engineer **ARNOLD TERRY** and assistant engineer **MICHAEL BROADNAX**, **MUSICOR RECORDING STUDIO** added a new line of instruments to their 8 track studio including a Fender-Rhodes piano, Les Paul Recording Guitar, ARP synthesizer, Gemeinhardt flute, Gibson guitar amp, Wurlitzer piano and assorted percussion instruments. The studio houses a Tascam 80-8 recorder with dbx noise reduction on a Tascam console. 2539 W. Columbia Avenue, Philadelphia, PA 19121. (215) 763-0741.

□ **THE KING'S PLACE STUDIO** has opened in the middle of Pennsylvania Dutch countryside, boasting a Harrison 3624 console with a Stephens 24 track recorder automated by an Allison Research 65K programmer. Both Dolby and dbx noise reduction are available; and for mastering, a Studer A-80 is used. Recording work to date has included projects for many major labels and television. Owner **JACK SCHNELL** attributes the success to "lower prices... and country living" in attracting producers from larger cities. New Providence, PA 17560. (717) 284-4165.

□ **HALF TRACK RECORDING STUDIOS** has added the following new equipment to their studios: Tascam 90-16; Tangent 32-16; Eventide flanger; Orban reverberation; Delta Labs Digital Delay, and two Neumann U-87s. 939 Radnor Street Road, Wayne, PA. (215) 687-6474.

□ **ETHAN WINER** and **ROB CARLSON** have announced the opening of **RECORDING CENTER, INC.**, the largest recording studio and commercial advertising production complex in Connecticut. The acoustical design of the facility was supervised by **KMK ASSOCIATES**, of White Plains, New York. Winer and Carlson have produced local and national spots for some years as well as a variety of soundtracks for audio/visual projects.

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• increased track capacity - gone 24. 16. 8 •

• added key people • won awards •

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R-e/p

STUDIO UPDATE

□ At **LONG VIEW FARM**, North Brookfield, **DICK WAGNER** is overdubbing tracks; **KEVIN HERRON**, **JESSE HENDERSON** and **GIL MARKLE** helping out at the controls. **ED MARSHAL** is in studio "A" for MCA producing **THE BLEND**. **BOB MILLETTELLO** is in studio "B" cutting tracks for CBS, **TONY ROMANO**, engineer.

□ **PART I OF II** has completed the final testing of its eight track studio. The equipment features Tascam recorder and console, professional dbx noise reduction, extensive signal processing, custom patching systems and a full complement of Oberheim and ARP synthesizers. **M. C. ROSE**, engineer and owner. 9 Sable Avenue, Dartmouth, MA 02747.

□ **PLANET OF THE TAPES** announces that it has become the first studio in Maine to offer 16 track recording by purchasing a Tascam 90-16 transport. Additionally, they have ordered a Tangent 3216 mixer, expected in July.

The new transport (with full dbx noise reduction) and board add to an already impressive equipment roster. The studio has been operating as a 4 track using Otari 5050 transports, and offering equipment including: Marshall Time Modulator, dbx limiting, Yamaha NS-1000 monitors, Neumann, AKG, and Sennheiser mikes, and a full complement of keyboards, including a fully reconditioned 1926 Steinway Model M grand piano. The 4 track rates will remain unchanged.

Among projects already slated for the new 16 track system are a single by **GENEVA** and album projects by **BLIND MAN'S BUFF** and **SAME BAND** veteran **DUAL SPACE ORPHANS**.

The studio is located on the Woodside Road, in Brunswick, not far from Portland, Lewiston and Augusta, and about a two-hour drive from Boston.

Southeast:

□ **BRT RECORDING STUDIO** announces its relocation from Otis, Massachusetts, to Ft. Lauderdale, Florida. At this time BRT has a 284-12 Scully and a multitrack 22 input board. The studio features ten different keyboards. 4602 N. E. 6th Avenue, Ft. Lauderdale, FL 33334. (305) 771-9410.

□ **BEE JAY RECORDING STUDIOS** was selected by **TURLEY RICHARDS** for the production of a **20TH CENTURY** album for artist **MARY WELCH**, and is currently working on demos for recent Fox acquisition, **SUNDOWN RED**. Both sessions engineered by **GENE EICHELBERGER**. **EPIC'S NANTUCKET** returned to Bee Jay with their producer/engineer **TONY REALA** for some final mixdowns. Also there for the date was **FRANK BOYD**, the executive producer and vice president of A&R for Epic on the east coast. 5000 Eggleston Avenue, Orlando, FL 32810. (305) 293-1781.

□ **CRITERIA RECORDING STUDIOS** in Miami have upped their collection of gold and platinum records to 83 with the addition of the **BEE GEES** "Love You Inside and Out," and the **ALLMAN BROTHERS'** latest **ENLIGHTENED ROGUES LP**. **CHUCK KIRKPATRICK**, who was part of the early success of the studio is back on board. Outside the studio, Criteria's **ARTISAN REMOTE RECORDING VAN** recorded **SUPERTRAMP'S** Miami concert. **PETER HENDERSON** assisted the Artisan engineering staff which included **ROSS ALEXANDER**, **KEVIN RYAN**, **STEVE KLEIN**, **MICHAEL GUERRA**, **LARRY JANUS** and **JOHN BERTHIER**. 1755 N. E. 149th Street, Miami, FL 33181. (305) 947-5611.

North Central:

□ Waupun, Wisconsin, has a brand new 16 track recording studio. **MADISON STREET SOUND STUDIO** features an Ampex 16 track recorder, and a Tangent 3216 board. Outboard equipment includes an AKG BX-20 Reverb, MXR Digital Delay, Eventide Harmonizer, Orban Stereo Synthesizer, Orban De-Esser, UREI and dbx limiters, and more. Microphones include Sony, Neumann, Electro-Voice, AKG and RCA. **NICK KUZULKA** and **WALLY MESSNER** developed Madison Street Studio with the express purpose of making professional recording facilities available to the area musician. Both the atmosphere and the rates are comfortable for just that reason. 17 N. Madison Street, Waupun, WI 53963. (414) 324-3021.

South Central:

□ **THE EARL SCRUGGS REVIEW** recently completed an album project at **JACK CLEMENT'S** Nashville studio, with **LARRY BUTLER** producing and **BILLY SHERRILL** engineering. Also in were producer **RAY BAKER** and engineer **BILLY SHERRILL** for CBS artist **FREDDY WELLER**. These dates were followed by **WILLIE NELSON** recording some **KRISTOFFERSON** songs, and **ROY CLARK** working on his latest MCA project. 3102 Belmont Avenue, Nashville, TN 37212.

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Studio (view from conductor's balcony)



Studio (view into control and string room)



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String Room

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Tape tension is servo controlled, as is the capstan (which has +15, -50% varispeed control), and wow and flutter is only 0.03%.

Control and monitoring facilities are comprehensive. A simple push-button matrix permits selection of line-in, sync and replay for any of the tracks and led's indicate the selected status.

The tape counter has a plasma display reading in minutes and seconds. There is also a highly accurate search-to-zero facility.

A special feature of the machine is that the whole of this control panel, and the varispeed control, can be used remotely. So once the machine is prepared, a single engineer can work a recording session without leaving the mixing console.

Replay S/N is 76dB (reference 510nWb IEC curve A); erasure is 70dB and record/replay frequency response is +1, -2dB (30Hz to 20kHz).

All signal levels can be adjusted by presets on each channel. The external power supply is fully protected and 19" rack mounting.

The Soundcraft SCM 381-8 is built to the highest professional standards throughout for the production of master quality recordings.

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STUDIO UPDATE

Midwest:

□ South Bend, Indiana, **AUDIO SERVICES COMPANY'S NOTEWORTHY STUDIOS** recently collaborated with **COMPUTER CREATIONS** to provide two synthesizer music logos for video animation.

The audio tracks were composed and performed by **JEFF GRAUEL** on an ARP 2600-Odyssey interfaced unit. Grauel has also supplied numerous music and sound effect beds for clients in the South Bend area.

The two audio tracks were composed corresponding to a time line of video events. They were then matched with the new animation process developed by Computer Creations. The computer assisted technique combines the style and flexibility of film/cel animation with the speed and precision of digital computers.

Northwest:

□ **BARBARA VETTER** has announced the completion of a 35 mm looping mixdown facility at **WARTHOG STUDIOS**. The film gear is constructed to run in interlock with a modified 8 track Tascam. The system, installed by **LASCO AUDIO**, will be expanded to 16 track in the near future. Equipment includes Stancll-Hoffman electronics, built by **SAM LONGORIA**, from OpAmp Labs components. 43125 S. E. 264th, Enumclaw, WA 98022. (206) 825-2102.

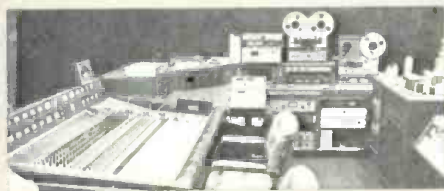
Southwest:

□ **JOHN RUGIS** is now directing operations for **RECORD PLANTS REMOTE** (Los Angeles, California). John comes to **CHRIS STONE'S** Record Plant from **BILL GRAHAM'S** San Francisco concert promotion organization. Artists recently recorded on location include **DAVID BROMBERG**, **JOE JACKSON**, and a Las Vegas engagement with **TONY BENNETT**, done in conjunction with **TRANS AMERICAN VIDEO**. 8456 West Third Street, Los Angeles, CA. (213) 653-0240.

□ The **SOUND FACTORY** has recently installed a Telefunken M-15A-A, 32 track, 2" machine, one of the first in the U.S. They also have available 32 tracks of Dolby noise reduction. The studio also features two EMT-250 digital echo chambers. Recent sessions included **DANNY KORTCHMAR**, engineered by **DENNIS KIRK**. **SLY STONE** has also been working at the studio, with **SERGE REYES** and **BUTCH LYNCH** engineering. Serge and Butch are also working on a project with **TASTE OF HONEY**, which is being produced by **LARRY** and **FONCE MIZELL**. Studio owner, **DAVE HASSINGER**, is keeping himself busy with **GENE PAGE**, who is producing himself. 6357 Selma Avenue, Hollywood, CA 90028. (213) 467-2500.



□ **STEVE GUY**, owner of **LOCATION RECORDING SERVICE**, has announced that their studio now features a Studer A-800 with full remote. It is one of the first to be installed in this country and will be operated in conjunction with the large Trident TSM board that the studio now has. Location has built their 25-year reputation through their mastering rooms, but the small, extensively equipped studio is developing a name of its own. **PAGES** will soon be starting their second album at the facility, with **BOBBY COLUMBY** producing and **MIKE VERDICK** mixing. **JESSE WINCHESTER** recently completed a project with **GREG GIDDENS** engineering. 2201 Burbank Boulevard, Burbank, CA 91506. (213) 849-1321.



□ **THE PASHA MUSIC HOUSE** is currently recording "The Music for UNICEF Concert — A Gift of Song," for **RICK STEVENS**, of **POLYDOR RECORDS**, along with **LARRY BROWN** as mixer. **JOHN D'ANDREA** is mixing the score for the **DICK CLARK PRODUCTION**, "Birth of the Beatles," with engineer **CARMEN RUBINO**. **DAVID ROSNER** producing **VAN DUNSON** with **BOB STRINGER** engineering. 5615 Melrose Avenue, Hollywood, CA 90028. (213) 466-3507.

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- increased track capacity - gone 24. 16. 8 •
- added key people • won awards •
- moved or expanded • added important equipment •

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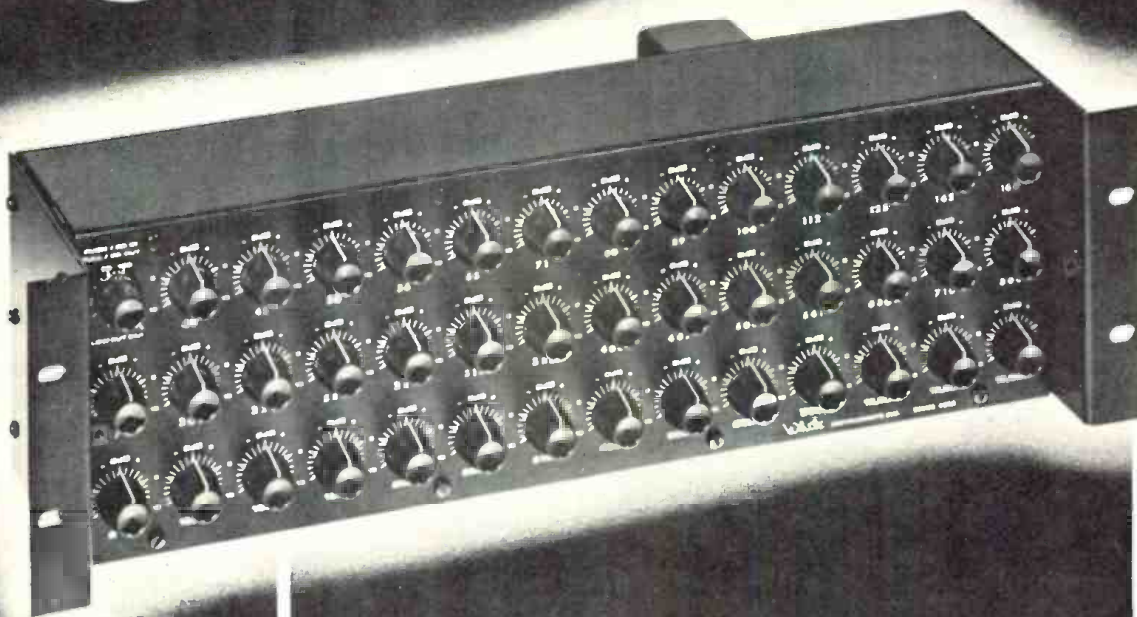
STUDIO UPDATE

- **CALIFORNIA RECORDING STUDIOS** in Hollywood announces its expansion to 24 track capability with the acquisition of the first Neotek Series III transformerless console on the west coast. Also purchased is a new MCI JH-16 24 track recorder with Autolocator III. The studio also features VTR playback and two live echo chambers. For booking information call **JOHN BRADY**. 5203 Sunset Boulevard, Hollywood, CA. (213) 666-1244.
- **PHIL SPECTOR** is working at **GOLD STAR** with **LARRY LEVINE** engineering the **RAMONES** in studio "B," and the **PALEY BROTHERS** with engineer **JERRY NAPIER**, in studio "A." **MINK DEVILLE** is also in session with **STAN ROSS** engineering and **STEVE DOUGLAS** producing. **DAVID BRIGGS** is mastering **NEIL YOUNG'S** newest release for **WARNER BROTHERS**. 6252 Santa Monica Boulevard, Hollywood, CA. (213) 469-1173
- **STEVE BARRI** is back in at **JENNIFUDY RECORDING STUDIO** producing **YVONNE ELLIMAN** and **ALLEN O'DAY** simultaneously. **PHIL KAYE** is the engineer on both projects. **MOTOWN** is in with **SHERRY PAYNE**, with **GENE MC DANIELS** producing and **MILT CALICE** behind the board. **LAMBERT** and **POTTER** are producing **MARILYN MC COO** and **BILLY DAVIS** with **MATT HYDE** and **J. LEWIS** engineering. 11115 Magnolia Boulevard, North Hollywood, CA. (213) 980-3872.
- **SMOKETREE RANCH PRODUCTIONS**, where **ROD STEWART** completed **BLONDES HAVE MORE FUN**, is now offering guest accommodations for those who want to work without interruption. The studio, set in the middle of Smoketree Ranch, has a fully automated 24 track console and extensive support gear available at no extra charge. 9752 Baden Avenue, Chatsworth, CA 91311. (213) 998-2097.
- **OVERLAND RECORDING** reports that **ALBERT LYON** has joined the staff as Chief Engineer. Lyon, formerly with Express Sound, in Newport Beach, and owner of his own studio — **OCEAN SOUND**, in Huntington Beach — will co-produce in-house projects with Overland owner, **PAUL FREEMAN**.
- **FILMWAYS/HEIDER RECORDING** (San Francisco) announces the re-design of studio "D," featuring a Neve 8058 28-in, 24-out console with VCA group faders, custom UREI Time Aligned Monitors, with Yamaha P-2200 amplifiers and UREI Third Octave Graphic Equalizers. Christening this newest studio update at Heider's was **TOMMY JOHNSTON**, adding vocals to his latest album with **TOWER OF POWER**; **TED TEMPLETON** to produce the project for **WARNER BROTHERS** with **DONN LANDEE** engineering with an assist by **STEVE MALCOLM**. **NICOLETTE LARSON** was also on hand for the session, adding vocals to several tunes. 245 Hyde Street, San Francisco, CA. (415) 771-5780.
- **THE AUTOMAT** has recently turned out projects for such groups as **SWEETBOTTOM**, **SKIP DRINKWATER**, producer; **JEFF TITMUS**, engineer. **THE DUROCS**, with producer **ELIOT MAZER**; **RON NAGLE** and **SCOTT FREE** shared the engineering duties with second engineer, **CHRIS MINTO**. **PAUL STUBBLEBINE** is now mastering engineer at The Automat. 827 Folsom Street, San Francisco, CA 94107. (415) 777-2390.
- **TEWKSBURY SOUND RECORDERS** recently announced that they have once again updated their facility. **DAN ALEXANDER**, owner of the studio, has acquired a Helios console which was originally at Olympic Studio, in London. Tewks has also become 24 track with the addition of a modified MM-1000 with 440 electronics. Recent sessions at the studio included **EDDIE MONEY**, **THE READY MAIDS**, and the **GENE CLARKE BAND** sans Gene Clarke. 6026 Bernhard, Richmond, CA 94805. (415) 232-7933.
- **PARVIN STUDIOS** celebrated their fifth year of operations by adding a 16 track MCI JH-10. Included in their updating is a new mixing console, an Auditronics 501, MicMix Reverb and Altec 604 monitor speakers. P. O. Box 16191, San Francisco, CA 94116. (415) 359-1853.
- Canada:
- **DENISE MC CANN** is currently working on her next disco LP at **LITTLE MOUNTAIN SOUND** with her manager/producer, **GUY SOBEL**, and engineer **LAURIE WALLACE**, to be released on **BUTTERFLY**. LMS has added an additional 24 track Studer studio and an 8 track production studio, according to **BOB BROOKS**, general manager. 201 West Seventh Avenue, Vancouver, B. C. (604) 743-4711.

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STUDIO UPDATE

□ **OCEAN SOUND** has just completed installation of a 24 track system, including 24/16 track Studer A-80 and two Studer 2 tracks. The studio has progressed from 4 to 24 tracks in two years under the management of studio owner, **KEN MORRISON**, who attributes their rapid growth to a "competent engineering staff and very competitive rate structure." 3127 West Eighth Street, Vancouver, B. C. V6K 2C4. (604) 733-3146.

□ **LIVING ROOM STUDIO** (Calgary, Alberta) is actually the living room of **RICHARD HARROW**, who recently did the soundtrack for **IAN TYSON'S** new album, "One Jump Ahead of the Devil." The equipment used on the session was the Tascam model 80-8, without dbx; one Model 5, 8 channel board, along with 25-2 for mix, a Sony recorder with TAPCO reverb for effects. The vocals were overdubbed using a Sennheiser 421 for back-up, and a 441 for lead. Following work on this project, Harrow expanded his system to 16 track.

England:

□ **GEORGE MARTIN**, chairman of **AIR STUDIOS** of London, has announced the opening of the newest AIR facility on Montserrat, a tiny island in the Carribean. Featuring a 52+6 channel Neve console built expressly to AIR Studio specifications, **AIR MONTSERRAT** is now fully operational and taking bookings. AIR Studio, c/o 9255 Sunset Boulevard, 2nd Floor, Los Angeles, CA 90069. (213) 550-0171.

□ **GEORGE MARTIN**, chairman of **AIR STUDIOS** of London, has announced the opening of the newest Air facility on Montserrat, a tiny island in the Carribean. Featuring a 52 + 6 channel Neve console built expressly to Air Studio specifications, **AIR MONTSERRAT** is now fully operational and taking bookings. Cambridge House, Melbourne, Royston, Herts., England SG8 6AU. Telephone: 0763 60776.

Germany:

□ **UNION STUDIOS** adds **CURTIS DRAKE** to its staff and he has been assisting **ZEKE LUND** on an album for **UMBERTO TOZZI**, from Italy. The upstairs studio is equipped with a Cadac board and monitor (24 x 28), Studer tape machines and a Telefunken 32 track 2" tape machine. The downstairs studio features a 40 x 40 Cadac deck and a Studer 24 track auto linked with a Studer 16. Clients include: **CBS, EMI, RCA, and WEA.** Allescher Ste. 16 D-3000, Munich 71, West Germany.

France:

□ **BARCLAY RECORDING STUDIOS** was the sight of the first direct-to-disk recording in France's history. The project was for the **BLACK AND BLUE** label, featuring **BOBBY DURHAM** on drums, **GERALD PRICE** on piano, and **MICHAEL GAUDRY** on bass. 9 Avenue Hoche, 75008 Paris, France. Telephone: 924.81.30/267.05.61.

Sweden:

□ When **AB EUROPA FILM** installed a new solid state computer controlled **SSL 4000** mixing console, they decided to celebrate . . . and 1,200 people decided to help. Turning the two large film studios into a giant disco, complete with Smorgasbord, AB Europa Film opened their doors to Sweden's film and musicmakers, with **BILLY JOEL** as their guest of honor. Kungsgatan 24, P. O. Box 1316, S 1111 83 Stockholm, Sweden. Telephone: 08-22 29 00.

Australia:

□ Seven-hundred-fifty-thousand dollars was the final talley when **ANDREW RICHARDSON** announced the opening of **PARADISE STUDIO**, in Sydney. The Hidley control room has 3624 Harrison console, Allison 65K Programmer, MCI 24 track recorder, MCI 2 track, Dolby noise reduction, EMT 240 gold foil, Lexicon Prime Time, equalizers from UREI, Orban, and more, under the care of **KEITH WALKER**, chief engineer.



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these are some of the interesting news items that can be announced in the next available issue. Write:

R-e/p STUDIO UPDATE
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of recording because through it one can alter the texture and the tone with the type of treatment applied, where applied, and by how music is applied. The re-re-recording mixer's responsibility is to make an artistic combination between each sound and to be responsible for the technical aspects of the audio film transfer. The second part of the job involves very well defined technical limits in which he cannot exceed because the end result will go to a photographic process. It's important to be aware that you're dealing with a medium that is exhibited in a wide variety of theaters, therefore you must strike a good average balance so that the product plays acceptably regardless of what equipment is used or how large or small the theater may be.

Tom Lubin: [R-e/p]: In the record making process, one mixer handles the blends of all the various elements of a track. By tradition and practice, film mixing has been done by a team of mixers, yet you do it alone.

Richard Portman: Well, when film recording first started out, it was done by one mixer who was an engineer. He would go on location and record the production dialogue onto an optical film. Then, he would come back to the studio and do the final mix. But, as movies with sound became more popular, the film industry realized that they had to set up some type of production line. They couldn't send a person out for six months, bring him back and then have him spend six more months remixing. So, it soon became a situation where they would put extra mixers on the panel for volume work. One man would only balance the music, one would handle sound effects and another was in charge of dialogue. They became specialists in particular areas. And that is the way it continued up until the last 10 or 12 years. Then, a man in New York named Richard Vorsac started mixing pictures by himself. His approach was absolutely right, and I have been working that way myself for the last year. With new equipment, high-speed reproducers, computer boards and, what I refer to as modern tools, there's no reason to use three people.

Tom Lubin [R-e/p]: As a film re-recording mixer, how much control do you have over what is recorded during production?

Richard Portman: Quite a bit. The requirements of motion picture sound are unique in that if we are shooting a period picture, we must come back with a soundtrack that doesn't include modern sounds such as an airplane. Also, our control is important in attempting to eliminate the need to re-record badly recorded material. I like to find out with whom I'll be working and talk to them before the shoot so that if they have any sound

Photography: Art Rex

Oscar Winner (SOUND)

Richard Portman

by
Tom Lubin

Tom Lubin[R-e/p]: What is the role of a re-recording film mixer?

Richard Portman: He is responsible for the balance of the various elements that make up a motion picture sound track. In

general, these are the dialogue, music, sound effects and the relation of one sound to the other so that the proper tone and mood that is intended comes across. Sound-to-picture is a very interesting form

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Richard Portman

problems on location we can get at it in a hurry. To independent producers we offer a support team that will back them up, help on the set, send what they need and check their soundtracks before they are too heavily committed to correct a problem.

Tom Lubin [R-e/p]: Do you participate in the hiring of those used for a production?

Richard Portman: Often I'm asked to recommend mixers, but the final decision has to come from the director. One big problem we have is that some of the directors either don't know or care that much about sound and it renders the mixer helpless to do a good job.

Tom Lubin: [R-e/p]: How did you get into film sound?

Richard Portman: It was kind of by accident. I came out of the service with no particular skills except for that of being a radio operator. This gave me some basic knowledge of electronics, and a friend got me into Columbia Pictures as a machine

PARTIAL FILMOGRAPHY

Richard Portman has been doing sound for film for over twenty years, and has worked in every capacity as it relates to the medium.

He has done production sound on location, maintenance on the dubbing stage, been a loader and recordist in the machine room, and functioned as a sound editor and scoring mixer. He has worked at each of the three mixing positions normally found in film sound (i.e.: Dialogue, Effects and Music). He now prefers to work alone and handle all the mixing functions himself.

Over the years Portman has been nominated for eight Motion Picture Academy Awards. His most recent nomination was for the *Deerhunter*, for which he won the Award. In 1975 he won the British Academy award for *Nashville*. In 1976 he was nominated for an Emmy for his work on *Roots*, (Episode #5), and the following year for *Eleanor and Franklin, Part II: The White House Years*. Over the years he has done over 160 films; including *The Candidate*, *The Day of the Dolphin*, *Funny Lady*, *California Split*, *Godfather I*, *Kotch*, *Little Big Man*, *Looking For Mr. Goodbar*, *Mahogany*, *Paper Moon* and *Young Frankenstein*; to name just a few.

He is currently vice president of Lion's Gate Sound, which is a part of Robert Altman's film production company.

loader trainee on the "Pal Joey" production. At that time the industry stepped up its filming and I lasted long enough to qualify for union admittance . . . and my career was launched. Eventually, I got a mixing job, and by the time I got that break I was already trained in the basics of the skill. My first mixing job was on a panel that I had been maintaining for 11 years! I knew where every jack point was, where all the tools were and how to hook each one up. So, the acquiring of the skills was just a matter of doing it.

TL: When music is mixed, there is usually a continuity of flow. But, with film every little scene might require radically different settings from scene-to-scene.

RP: That's correct. It moves like a shot. Cartoon sound remixing really separates the men from the boys. Just about every second there is a 'bonk,' 'crash,' 'zip,' 'clang,' and the like and the whole thing is over in five to seven seconds. I don't like to do them. If I see a cartoon coming, I run for cover. Richard Olsen is a man who specializes in cartoons for Hanna-Barbera, and he's a master. But a cartoon will reduce me to shambles because of the amount of material and number of cues in such a short time. The same kind of situation occurs when there is a car chase. Motion picture sound recording is one layer on top of another, we can't have a car come screaming around a corner unless it's accompanied by the engine roar, the squeal of wheels, the ambient background, and any dialogue that's going on. It's likely music is sawing away to add to the excitement, and if there are cops shooting then there are gun shots. All these things are happening during one segment of time. We might sit with one or two tracks playing and suddenly, we'll have twenty tracks that will be on for only five seconds. it happens very quickly.

TL: Describe the other positions that technically support you while you're mixing.

RP: I have a recordist who is the crew chief and runs the room. His overall responsibility is to supervise the lining up of all the tracks on the proper machines. Doing the patching in the machine room and listening on earphones to the recording as it goes down. Though I play everything back, his listening insures that it is getting there. Working with the crew chief is a machine loader who is responsible for actually threading the film on the correct start mark, and assisting the recordist in any way that he can. Both the recordist and the loader must work very quickly as well as accurately since it is a speedy process.

With the machine room crew there's also a projectionist who keeps the picture sharp and tight on the screen. Behind these three is the engineering department. On every job we have a maintenance engineer assigned to the task of keeping us on the air. If

something passes out it's his responsibility to patch around it, get a new piece of gear, or repair it. And they must do that quickly because that's down time, and that costs us money. If I work all night there will be an engineer, projectionist, loader and a recordist on the session. The group works as a unit.

The cost of a film sound studio, because of the number of people and the type of equipment involved, is close to \$400 an hour, plus overtime if necessary.

TL: Are you able to punch-in to your remix?

RP: Oh, absolutely. Pick-up recording is necessary. I can punch into stereophonic recording, six track; whatever I want. In the old days they didn't think that you could do that, and I didn't know that you couldn't. If you were doing something and it broke down in the take, you went back to the top and started again. When we tried it for the first time, I told everybody to freeze and we then backed up a few feet and punched everybody in. From that point everyone in the business started to realize they could punch-in to the remix. We do it all the time now, but I don't like to constantly be going backwards and forward, and stopping and starting.

What I try to do is get down all the mechanics in a pre-dub. If there's too much material to handle I'll break it down into smaller bites. I will make a high quality pre-dub or pre-mix. I use noise reduction on the recording so there's no significant signal-to-noise loss, and I get it down on one piece of film. When I do the final balance I like to go all the way through the reel, because with pick-up recording you can blow a small area and if 90% of it is all right, then we'll go back and fix that 10%. But if you stop and go and you're only doing five feet at a time and out of context, it fries you. This sort of thing especially happens in television. By the time you get to the end of a reel and they say "print it," you should hear the track . . . and it's up and down, in and out, and there is just no way you can put any movement, or smoothness, into it. So I try to get my problems worked out first.

The first thing that I do is my dialogue. Next I'll turn to the sound effects and get them to where they are manageable. Then if the music requires a lot of attention to make it play against the screen, I might pre-dub the music. At this point, I'll put up all three elements. When I'm working with additional mixers we will rehearse it a couple of times. About the time that we're ready for the third run-through I'll know enough about the reel to take it. So then I'll go all the way through with the recorder on. When we get to the end of the reel we'll discuss it among ourselves and with whoever is on the stage. When it's nearly there we'll just go back and pick up what needs more work. It goes very quickly that way.

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TL: Are you able to physically edit your mixes?

RP: Yes, but it depends on what they are doing with the picture. Theoretically, when the picture arrives at the re-recording stage it should be in sync and edited. We shouldn't have to do any editing at all. But oftentimes the picture is not fully edited as they have not yet made up their minds. Or, they haven't cut the negative which is the determining factor as to how much more you can cut the picture. Once they cut the negative it's very difficult to make any further edits other than what they call "lifts." That's where they remove a section. You can't put a section back in because if you do you lose a frame every time you cut it and you get a "jump cut."

From time-to-time we will hold a take, set that aside, and we'll put up another one. Also, from time-to-time we will sweeten or cross-copy. That's when we copy the dub and add something to it. This is more common when you're working with a conventional mix where you have three separate elements. That is to say that on a monaural recording the dialogue, music and sound effects are each recorded on a different stripe of a three-stripe magnetic film. It could be that the dialogue and music were perfect, but the sound effects were so complicated and difficult that the mixer had problems and could not manipulate it. Or, it was badly cut or something was missing and they wanted to add it later. It might be so complex that we don't dare remix it so we copy and add to it. I don't like to do that, and try not to, but sometimes we just have to.

TL: Who makes the determination what effects are used and where they'll go?

RP: After the film has been shot and cut, the producer will turn it over to sound editors. The sound editing team functions much like picture editors except they deal with the soundtrack. The picture is run for the sound editors and the director and whoever has an artistic interest in the film.

While the film runs they will sing out and tell the sound editors what specific sound effects they want other than just what they see which is the first responsibility of the sound editor.

In our operation I work hand-in-hand with our sound editing staff. When we record a picture that we have any type of control over, our in-house people and some chosen outside people all get involved. Many times we'll be looking for sound effects before the film has even been shot because the script will call for something that we know will be a problem. In such cases we furnish sound effects recording personnel at the location. For example, if we're doing a western and we have a hundred horses we'll get the production company to keep the horses for an extra day so that we can record a series

of horse effects. Horses in, horses out, milling, running, walking, two horses turning and the like. We make a sound effects library to utilize in the film later. This is at the top of the scale for sound editors. At the bottom is somebody who's just sitting at one of the studios pulling things out of a library. They don't really care whether it's the right horse or not. They just slop it in, and you do the best you can in the remix.

TL: Do the higher budget films get more attention?

RP: You'd be surprised. Many of the high budget films have terrible sound editing. It comes down to a matter of taste. If the re-recording mixer doesn't work closely with the sound editor he's cutting his own throat. You just can't do one without mutually relying on the other.

I was trained by a sound editor so I understand what they do. They have my absolute admiration because it's a dog of a job. There's no glory at all in it.

TL: Production recording on the set has also changed significantly in recent years.

RP: Yes . . . let's take Robert Altman's multi-track recording. He records on a Stephens eight-track. Effectively he has a seven-track recorder with track eight used for sync. We use Micron radio microphones on the actors. If he has a giant scene we might also use the back-up machine which we send on location so they have fourteen tracks of dialogue. When the material comes in they'll take it off the eight track and transfer it to individual units for editing, because the picture editors will literally move lines of dialogue from one place to another. Often you're faced with leakage from other people that you have to eliminate. You also have to cheat these lines into mouths so they will appear to be in sync. It's not unusual for an Altman show to come into the dubbing room with as many as 16 or 20 dialogue tracks. That's before I see sound effects or music. To deal with this I usually get the dialogue long before I get the sound effects or music. In fact, I'm working on the dialogue for the film Robert Altman is doing right now. It's still in picture editing, and has not yet been turned over to the sound editors and won't be for a few more weeks. But each day I check the production tracks because they're laced with problems. Anytime you have overlapping dialogue on separate tracks and then start to move around that overlapping dialogue, it's murder. You have to really be careful to maintain sync, because if you get a little bit ahead or a little behind you can really see it.

TL: Do you work on the dialogue with or without the picture?

RP: I always work to picture because you have to take so many visual cues, and often must anticipate where a line is going to

enter. As an example, just at the point where the guy in the corner steps out of frame — that's my cue to bring in this other track and close the other one off.

TL: What happens at the end of a day's shooting?

RP: The film dailies are processed at the labs and brought to a film editor, and our sound department transfers the daily tracks off to a three track film. They assign the various channels of the seven tracks to the three track. We might put channels one and two on channel "A" of the film, and three, four and five onto "B," and six and seven onto "C" of the film.

TL: Who decides which of the tape tracks are transferred to each of the film channels?

RP: The production mixer decides that. He puts on his log where he wants things assigned, and he then gives the initial assignment for checking the dailies.

When the sound editing process actually begins, each of the tracks are transferred to separate pieces of film. The sound editors then take the separate tracks and cut them into varying units of what they want to use. They will find the track with the loudest ambience and make a one-to-one transfer, cutting out all the clicks, and extraneous noises, so they end up with a consistent background. They'll make a loop out of that and then cut it back into the dialogue track. They get rid of all the background noises on the other dialogue tracks as they now have created a homogeneous ambience fill track. When the film gets to me it's filled with ambience that's built right into the track. We can't have seven of these fill tracks, or one for each dialogue track, because the time and cost would be enormous, so we take the track with the highest background noise. For example, if the camera and microphone are pointed at me and there is a very high noise environment behind me like a freeway, the microphone will pick up a lot of traffic noise. If we now take the reverse shot, that is someone who is facing the freeway, the amount of traffic leakage into the microphone will be less because it will be facing away from the freeway. If we take those two tracks, cut them back and forth, and use the corresponding sound tracks, everytime the visual prospective changes the audio background is going to change radically. So, the sound editor fills through with the louder ambience. That gives us both tracks with a constant background.

We usually do no more than two tracks like this since it's so time consuming. I will then swing between these two backgrounds. I don't want to hold up the high background all the time because that's very fatiguing. As the dialogue approaches where we're going to have the cut, I'll start to cheat the second dialogue track in. The background with the dialogue is more natural than using a loop or

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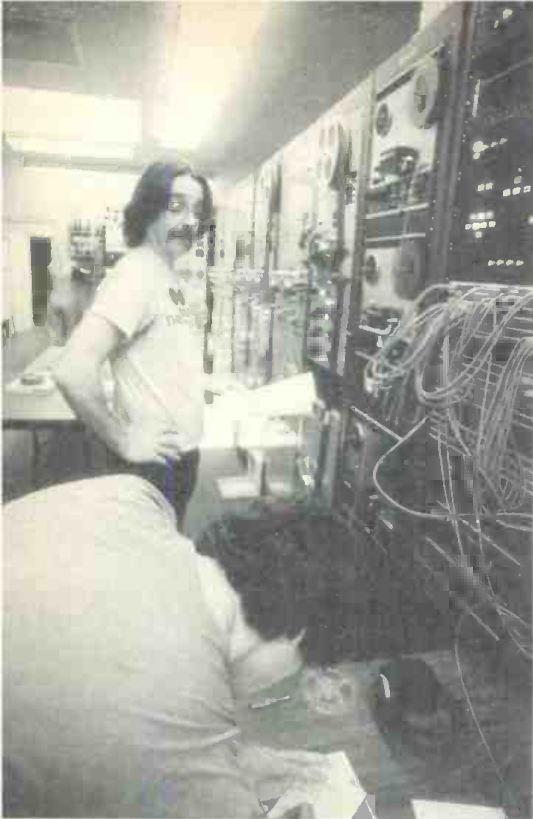
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riding it in. These segues must be made consistent so the sound shouldn't change on the cut. The sound editor will also extend in front of the dialogue what we call a "handle," or some ambient sound that fades in preceding the scene. I might use a razor blade and make a long taper fade so that I can just set the level, and I won't have to worry about fading it up right before a dialogue entrance. Because it's a lower level sound it should come in and go out without anyone becoming aware of the tracks.

During the dialogue pre-dub I may decide to not use a fill. Sometimes what they have

prepared doesn't work out, possibly because a Moviola's sound reproduction system is so much smaller than a theater speaker and not high fidelity.

TL: When you prepare your pre-dub tracks do you mix onto a multi-track magnetic film?

RP: Yes.

TL: Six track?

RP: Well, I don't usually like to use six track for a pre-mix. I do on music from time-to-time because the crosstalk in the head is not important, and the phase relations are the same. But I don't want to put anything on six track that would give crosstalk. You need at least 70 to 80 dB of rejection between heads which you have on 35 mm three-stripe. They are very wide heads and the film has gaps between the three magnetic emulsions so we put all the gun shots on one channel, and the ricochet on another. When we pre-mix we want to make sure that we don't tie anything together that will conflict later.

TL: Since the track width of magnetic film is so wide, the signal-to-noise and response of these reproducers must be very good.

RP: The specifications are fine. There's nothing wrong with the technical aspects of the motion picture sound recording. They're flat from 20 Hz to 20 kHz. That's more than adequate since the effective frequency response of motion picture optical recording usually runs from about 40 Hz to 9 or 10 kHz. The problem, and the reason that people feel the quality of sound is not that good, is that there is a misunderstanding between the two types of recording engineers. People who make records deal with home entertainment. The reproducer is

at the discretion of the consumer. They are also dealing strictly with music mix with no picture. They are not required to take their product to a theater and play it for people. The motion picture problem is one of trying to get sound through a screen and then all the way to the back row so everyone in the audience can hear. Intelligibility has to be there.

The bottom line is that it's two different disciplines with different requirements, parameters and end results.

When a music mixer works on a film score he needs to realize what will happen when the music is dubbed into a film. When that score is ultimately placed underneath the dialogue it will sound different than when it was played at full volume and by itself. It's usually necessary to add more bottom and top to the score during dubbing.

After it's all done the fact is the only place that it will sound as we heard it is on the dubbing stage, and maybe a theater that's been properly tuned. Most theater owners, however, won't invest the money to get their systems running exactly as they should be. Once they install a speaker system or amplifier system it may not be touched for 15 years. They will have no idea whether the driver is burned out, or if the speakers are dragging, or if the amps have gone bad.

TL: When you are making a stereo record and you pan something from left to right, something on the right will not be present on the left, and vice versa. With film that's not the case?

RP: Not really. We set up a divergence. The speakers never go off.

There are three forms of stereo now. There's the Dolby stereo optical, which is binaural. It manufactures a center phantom signal through a network. It is recorded on optical film. Left plus right result in the center if everything is equal. It has a certain divergence. If you swing to the right there will always be a little sound going to the left.

Another form is six track. That comes down to left, left-center, center, right-center and right. The sixth channel is used for any surrounds, or speakers outside of the screen area.

The third is like the six, but there are only three speakers behind the screen; left, center and right. The other tracks are used for surround. Those are the three basic approaches.

TL: Tell me about the use of Dolby in film. Movie ads indicate its use is becoming more and more popular.

RP: I was one of the first in Hollywood to use the Dolby magnetic process and that was on the film, "Nashville." Dolby equalized the monitor system, and it worked very well on the three channel hard magnetic. It was very simple and straightforward. The only thing we had to do was make sure the needle

COLORTRAK CHANGES NAME TO KINTEK

John Mosely, president of Colortrak, Inc., who has been responsible for the development of the Colortek sound system, has announced that it will henceforth be known as Kintek.

This change has come about as a result of the formation of a new corporation, Kintek, Inc., which incorporates the motion picture interest of both Colortrak and dbx. The principals of Kintek are David E. Blackmer, president; John Mosely and Zaki Abdun-Nabi, vice presidents. George Finkhausen is marketing director.

The corporation is headquartered in Newton, Massachusetts, where it will carry out engineering and manufacture of equipment for motion picture sound recording and reproduction. Research and recording facilities will be operated under John Mosely's direction in Hollywood, California. Marketing will be handled out of Tucson, Arizona.

The Kintek sound system is covered by U.S. Patent 4,124,784 with other Worldwide Patents Pending. It has been in development for nearly four years and will be introduced into commercial usage during 1979. The company is anxious to provide the industry with a system that fulfills all of its requirements without compromise. Kintek distinguishes itself by providing both, an Academy Mono track together with four separate wide-range stereophonic tracks within the standard optical sound track area. This means that only one type of print needs to be made for purposes. Kintek introduced three products at Show West, in Las Vegas, Nevada. The most unusual of which is the Stereophonizer, which creates three channel stereo out of monophonic prints, thereby giving enriched sound quality to all films and utilizing the full capability of the theater's sound system.

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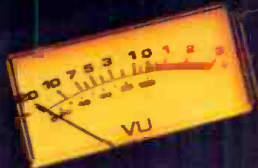
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pointed to the right zeros.

A magnetic stripe print is made on what is called "Fox" perforation. In order to accommodate the stripe, the film has smaller sprocket holes since the size of the film can't be changed, and neither can the picture. So they shave the sprocket hole size. The emulsion is striped to both sides of the two rows of sprocket holes.

The film also has an optical track so the picture can be shown at theaters that do not have a magnetic playback system, or ones that don't need it like drive-ins. Since optical sound uses a bi-lateral modulation it can be reproduced using only one side of the track. And, because of this, a magnetic stripe covers half the optical modulation on "Fox" perforation film. Each of the three front tracks are the same width, while the fourth surround-sound track is narrower. When you take a track that narrow the signal-to-noise is pretty bad, so Dolby really helps that.

Then Dolby decided they wanted to really get into the motion picture business and came up with their Stereo Optical Process. The first picture we used that on was "The River Niger," and the system was terrible and still is. You just don't get back from the optical what you played through their monitoring system. The optical process has too many variables and the Dolby System just can't handle it. The best that they can photograph on a film, even with the Dolby, is 12 kHz and most of the time I'd be surprised if you get that. You have problems like the film fog factor, the high frequencies shading in, the grain of the film, the actual physical parameters of the film, the cross modulation . . . anything can go wrong. Hence, Dolby is

High speed reproducers and computer assisted mixing consoles are revolutionizing film sound production.

unable to deliver in the theater a one-to-one of what you've processed. The other problem with the system is that it does not have a hard center channel.

The problem with a binaural recording in motion picture work occurs when you play the film on a giant screen. The sound will be coming through channels one and three and the center will disappear because of the wide spread of the two speakers. Conversely, if you have the two speakers in a small theater then everything will build up in the center and you will lose any sense of left and right. So you have to have the hard center so that the sound won't build up and drop out as you move something from right to left.

In each of the magnetic formats you have

a hard center. There's no hole. There's always some sound diverging. If something is hard right it will only be down about 20 dB in the left speaker. That's the way film panning systems have been designed.

How it works is they come in and line up the remix room monitors. They ask if you feel enough center channel. If you want a little more they'll tweak it to give you more. But when you go to the theater the center is gone. If you sit on the right side of the theater you hear everything through the right horn, and if you're on the left you hear everything through the left horn. Plus it won't have the same top end that you were working with in remix.

Another problem unique to the system is that when you're working with an extended range system you hear more, so you run your levels lower than usual, consequently the picture plays low since no one raises it up. When it hits a loud passage you want to hear it, but you're also working into maximum level on the optical track so you just can't turn it up. With magnetic film you can push it more because the distortion is softer, but when you saturate an optical track it becomes a square wave and a buzz track.

TL: Is there a better process available?

RP: dbx has a very fine process, but you've got to get theater owners to buy it. Since they've just installed Dolby, I don't envision them buying another piece of gear for another thirty years.

TL: How much does the sound change as a result of going through the screen? What sort of difference is there when that same movie is shown on television?

RP: High quality motion pictures that have a reasonable dynamic range that was recorded for theaters generally play very poorly on television. They're dynamically too wide. The low level stuff just disappears. You're also faced with the high and low end cut-off as a result of going through the tube. If the picture was originally stereophonic quite often the print that is played for television is a mono dub-down, or sometimes just the optical part of a mag/optical. Which means the signal-to-noise is 6 dB worse than a full-width optical track. It will hiss and suck, and pump up and down, and fall below the dynamic range. The television processing also effects the result. I think if you do something for television you have to make a mix for that medium and with those parameters in mind. You'll need to shorten the dynamic range.

TL: Can't they use compression at the station?

RP: No, or you will end up compressing material that's already been compressed. Remember, the film has already been treated by a variety of electronic devices.

One of the more standard tools in dialogue recording is a compressor. Nearly all dialogue goes through one to catch the expansion because you cannot have the level exceeding the optical maximum level.

TL: Do you find that in comedy you have to ride dialogue in anticipation of laughter?

RP: Oh, yes. What we prefer to do is make a mix on the picture, take it out and preview it to an audience, and record on a cassette the entire movie. Later we can play the cassettes and see where people laughed and where they didn't. If there are placed where the wait is too long, or too short, we can then go through and make adjustments to accommodate.

Which leads me to the thing that's really going to help the motion picture business, and that is the computer assisted mixing console. A good number of people are skeptical of it, but the ability to program something to turn on or off and have it continue to do that at the proper time and the correct level will really take the burden off the mixer, and can't help but to improve the product. It will eliminate mixers having to remember in the course of running the film where the re-recording cues must come in, particularly on switching; or things that must go in and out. With the computer, we'll be able to go through and just work on one thing at a time, and get it down, then move on to the next thing, knowing that the computer has locked what we wanted in its memory. We can also raise or lower the inner mix through the aid of the computer, and we can do away with generation loss since we need less pre-mixes. The board in a sense becomes a recorder.

The Dolby Cat 43; for eliminating noise it's one of the most useful tools we have. I wouldn't do a film without one.

TL: Tell me about your new Quad-Eight board.

RP: I first operated a prototype a year ago on a film called "The Wedding." At that time we had serious problems with the board, but it became apparent to me that the device worked. The main problem turned out to be that a floppy disk was not aligned properly, so we weren't always able to retrieve the program. That problem has now been worked out. The board we are getting will be fully automated with 36 positions. I've decided not to include automated equalizers. I've found them to be unsatisfactory at this time because, in addition to other things, they have a loud clocking noise.

The other thing that's going to help the



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... mixing sound to a work print at Lion's Gate

remixing operation is the high speed reproducer. Traditional film projectors and their audio counterparts have always run at real time. You could not high speed or roll in to a particular point. Nor could you rewind at any faster speed. If you did a nine minute piece of film it would take nine minutes to rewind. By the time you had gotten to the top the whole rhythm of what you were doing was gone. It was even worse if you were dealing with clients who weren't exactly sure of what they wanted. It left them too much time to change their minds.

When the first Quad-Eight automated board was installed at Goldwyn they also replaced the reproduction and projection systems with high speed Magnatech units that could run forward or backward at six times speed. However, they found they couldn't run them that fast, particularly in the 1:85 aspect ratio. They didn't have a

positive intermittent so the picture would move up and down.

TL: What do you mean when you say 1:85?

RP: That's 1:85 to 1. The ratio of the anamorphic cinemascope picture is 2:35 to 1, which is a thin, very wide picture. The 1:85 is not as wide but has more height. It's a common aspect ratio in film.

Magnatech has since worked out the bugs and has found that they could not run the units at that fast a speed. Their new units run at four times speed and have a positive intermittent.

TL: Another recent development in film sound has been the increasing use of the Dolby Cat 43. I've seen them in a number of film stages.

RP: Steve Katz, from Dolby, brought that to my attention. When we started using Dolby noise reduction we found that the extended range monitoring resulted in every little noise being heard.

You see, previous to the noise reduction device every film utilized an Academy roll-off filter in the playback system. It's purpose is to approximate the loss encountered when going to an optical track. It rolls the high frequency off at a fairly rapid rate. The channel may be flat from 20 Hz to 20 kHz, but the monitoring system surely is not. This filter forces the mixer to add top end, in

effect pre-emphasizing the track so that it will play through the filter.

The Dolby system of noise reduction does not use the Academy filter, so what happened is many mixers started to complain about the excessive top end. Low pass filters were tried with less than satisfactory results. What they ended up with was a very dull sounding track with a very bright envelope. What came out of all of this was the Cat 43 which allowed you to compress particular frequencies with its effect being much like an equalizer. It has four bands that are very well defined so that if you're working on one area there is little effect on the rest of the audio bandwidth. By using the unit properly you can shave off that hissing sound that is synonymous with over-brightness. It is very effective in the mid-frequency range about 1 kHz. You can reduce the white noise, and the running sounds that come from the camera, without an adverse effect on the rest of the information.

Before this device came along we would use dip filters, but often that would give a very strained, distorted sound. The Dolby Cat 43 does it beautifully. It doesn't require encoding and is self-contained. It's a fine piece of equipment that gets startling results. It plugs right into one of their regular units. I wouldn't do a film without one now. It's one of the most useful tools we now have.

TL: In the last couple of years a number of films have been made by people in the music industry who have made their fortune in records. They're doing major productions as first efforts. You're dealing with record people who basically know very little about film.

RP: And they are dealing with film people who know nothing about records.

TL: What suggestions can you make to record people with regard to film sound?

RP: Well, more often than not, they arrive as just babes in the woods. When they come in they tend to be suspicious. They've heard terrible horror stories. It's a new thing for them. I guess the first thing you have to do is get their confidence, and try to explain to them the proper structure and that in the end result it's a different format. You try to guide them into not making mistakes caused by a lack of knowledge of a new medium. At the same time you have to extract from them what they want and to let them know that we can do it. If we don't have what they need, we'll get it. The idea is to do the absolute best recording job we can on a film and see to it that they are happy.

A very difficult thing for record people occurs when, after working with an engineer that they know and trust, and who has done a fine job of recording a number of their music projects, they must then go

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someplace else and work with a film mixer they've never known. Some sort of rub is unavoidable. So, I like to invite the record mixer to come along. I'll try to work with them. I feel I have to let them know that I'm not trying to take away what they do, because what I'm doing is balancing a motion picture, and the focus of most of the people who come out of records to make a movie is generally toward the music. That is what they know best. I try to draw to their attention that no one is trying to change their idea of what it should sound like. Sometimes though, you just have to tell them that they cannot get what they want to achieve. Where that usually occurs is in the music.

When someone makes a movie and they are going to release a soundtrack, I ask the customer to send me the music with no EQ or reverb. They should take the music and mix their record as a separate thing from the film since it's very likely the record mix will not sound right against the film because the relationships are different. As soon as you pull that music down, and put it behind the screen on three horns instead of two, all the rules are different.

TL: *The size of the room and the type of speakers?*

RP: Yes. Keep in mind those speakers were designed in 1936 and haven't changed much

since. That's the nature of the business. The best thing they can do is come in with dry tracks with a certain amount of separation. That doesn't mean five tracks of drums. The remixer isn't interested in re-balancing the drums. Get that down dry and in groups. If there is a change in level against the screen, or if you want to do some effect with the sound against the picture, you have the ability to do it. If you don't mix against the picture it's not going to sound right with the picture.

TL: *Synchronization can also be a problem.*

RP: Oh, yes. You can't drift. You have to be right on, and with a positive sync. If you're doing a picture where people are going to sing on camera then you have to do a playback and that presents problems. You can shoot live recorded sound like "Nashville," but if you do then you have to be sure you've got adequate and proper camera coverage so you can cut it. You just don't want to be stuck with one scene. Also, you have to consider the stereophonic picture. If your cutting is such that you are looking at a scene and suddenly you reverse it and look back over the same scene, the guy with the saxophone who's been playing on the right side of the scene for four minutes is suddenly on the left side of the screen. Obviously, you have to be able to get at the saxophone alone. Are you going to

move it over on the cut or cheat it over, or what exactly are you going to do against the cut picture? You may want to go to a close-up of the drummer doing something in the picture. In a music mix without picture the drums have been set at a particular level. Now suddenly that won't look right. So you have to be able to cheat-up the level of the drums because you expect to hear the close-up you're seeing. Conversely, if you take the film music mix without the picture you'll find it out of balance. The drum will jump out here, the sax will be too loud there but with the picture it works.

TL: *Do you tend to mix differently when you're working with a color print.*

RP: Yes, we work almost always against a black and white duplicate picture. They call them one-light prints. They take the color picture, if it's a color picture, and more than 90% of them are, and strike a black and white, one-light duplicate off of that positive. It's usually terrible and will be dark or washed out. We mark cues on them. When we put up a color print everything sounds so much better. You see everything and it's sharp as a tack. It seems louder and everybody loves it. So we save the color for playbacks, particularly if we are having trouble selling the reel.

— continued overleaf

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had a dip filter. I remember I used to work with Russ Hanson, the chief engineer there. He is retired now. We would do all the camera and extraneous noise elimination for everyone in town. He would spend days on the panel while I operated the recording equipment.

We got some really different jobs. One year Disney shot a western. Something happened and it went on the shelf. When they came back to it they discovered the tracks were full of airplanes, trucks, generators and subtle noises. They couldn't replace the boy's voice because by this time his voice had changed. We spent weeks trying to eliminate those noises. Nowadays the tools are better.

TL: Tell me something about Lion's Gate and the approach here.

RP: The biggest thing is that everyone here is involved in the total product. There's no separation between departments.

During the many years of production line sound the various departments in the process have been very compartmentalized. When we decided to put in a sound department at Lion's Gate the whole idea was total involvement. When we are hired to do a film, the sound team of the sound mixers, editors, projectionist and engineers begin work on the picture before they start to shoot, not after. That is a main difference between us and the other places. We are more tailored to the particular job.

We will go out and get new sound effects. We don't rely on libraries. The sound editor, mixer, director and producer all work together and decide what we need and where. We'll go out and get the proper thing. We don't lay people off, we keep a full staff year 'round. That makes for much better continuity to have people who know they belong to a family. The thing about this business is that you work at it really hard and long and spend a majority of your life sitting in these rooms. And without total involvement it just won't turn out right. We do the best possible sound job we can do every time.

When someone comes to Lion's Gate, we will suggest to them what we would like them to do. If they want to do it another way, that's okay. We can do it that way, too.

TL: You would like them to use your whole support team?

RP: Absolutely. They are people who know how it's done. If the customer already has his own support team, that's fine, too, because there are many good people available. It's just more convenient for me to utilize our personnel, but that is not a requirement to work here. We'll even make the stage available to guest mixers.

TL: You have one studio functioning now, and one on the way?

RP: Yes, one will be just remix and the other will be able to accommodate a small orchestra for doing scoring. It will be a music room with multi-track tape as well as film recording, and will be competitive in every way with other music recording facilities.

We want it to be a place in California where record as well as film people can get some music down to picture with a minimum of fuss.

TL: Do you see digital recording becoming important in film?

RP: Yes, I do. I think it's just around the corner. Lion's Gate hasn't done anything about digital recording because we're waiting to find out what emerges, but it's on the way. I do expect big things out of a digital approach to film sound.

TL: Could the optical track be utilized in a digital format?

RP: I think it would still be limited by the film. The higher the frequency the harder it is to photograph. I think the soundtrack is going to have to change. I don't know if they will continue to use the existing area or go to some phantom way of recording on the picture portion of the film. There is a fellow who is trying to convert audio to an ultra-violet form and introduce it over the full width of the film. You could have thirty soundtracks because the usable area is as wide as the film, but that's probably some years away. If you look back over the history of motion picture sound the thing that has kept film from having better fidelity is that sooner or later it has to go on that piece of film.

You can't send the film to the theater on two mediums. We tried that when film sound first started and the sound was on a phonograph record. Well, as soon as you separate the sound from the film things are going to get lost and mismatched.

But it's going to change, be it digital or laser, or ultra violet or whatever process will result in a better product.

TL: What about magnetic stripe on the film?

RP: It takes too long to make and the cost is high. In fact, about \$5,000 for a single print, and the magnetic emulsion wears off. Also, they don't align the heads in the theaters. You also have the problem of magnetism which gets picked up from time-to-time and the next thing you know the prints are slowly getting the top end erased out of them. A magnetic track isn't really the ultimate.

TL: How much do you think winning the Academy Award has affected your future?

RP: It already has, although I've always enjoyed a pretty good reputation in this business. As for my work, the award has made it easier to deal with customers because the honor gives me a good solid base on which to stand. □ □ □

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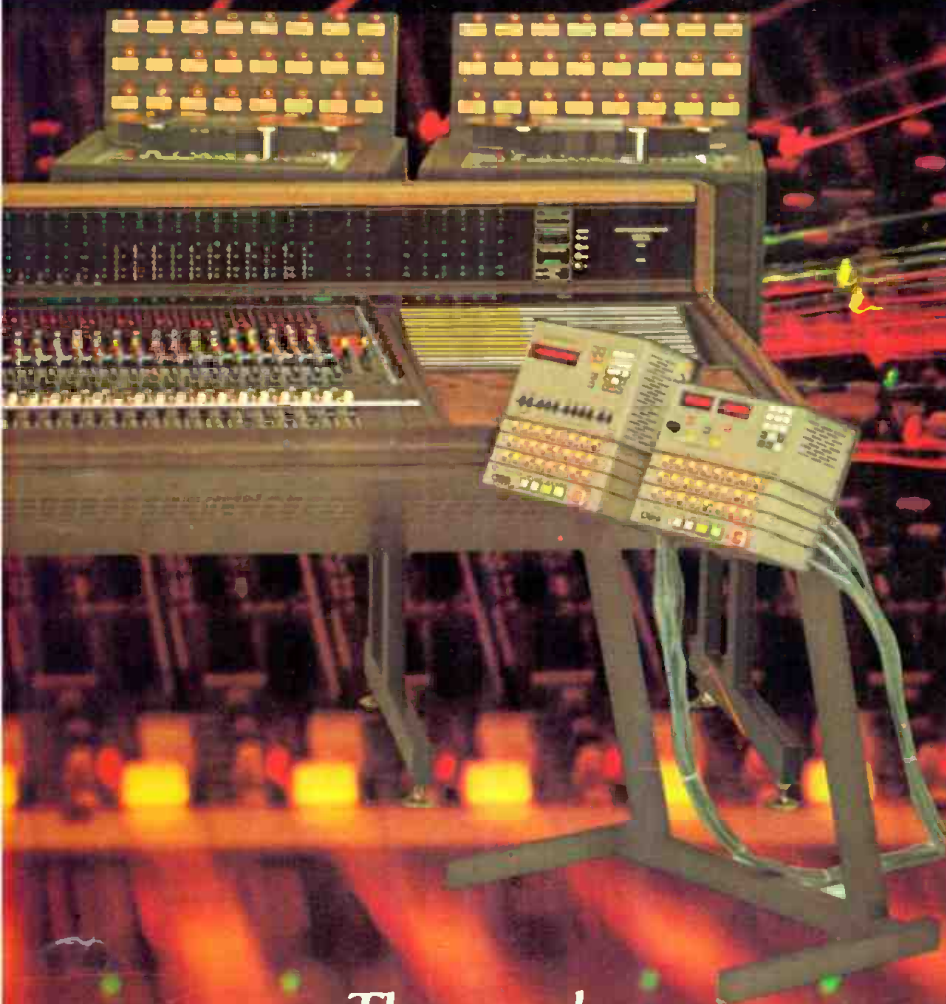


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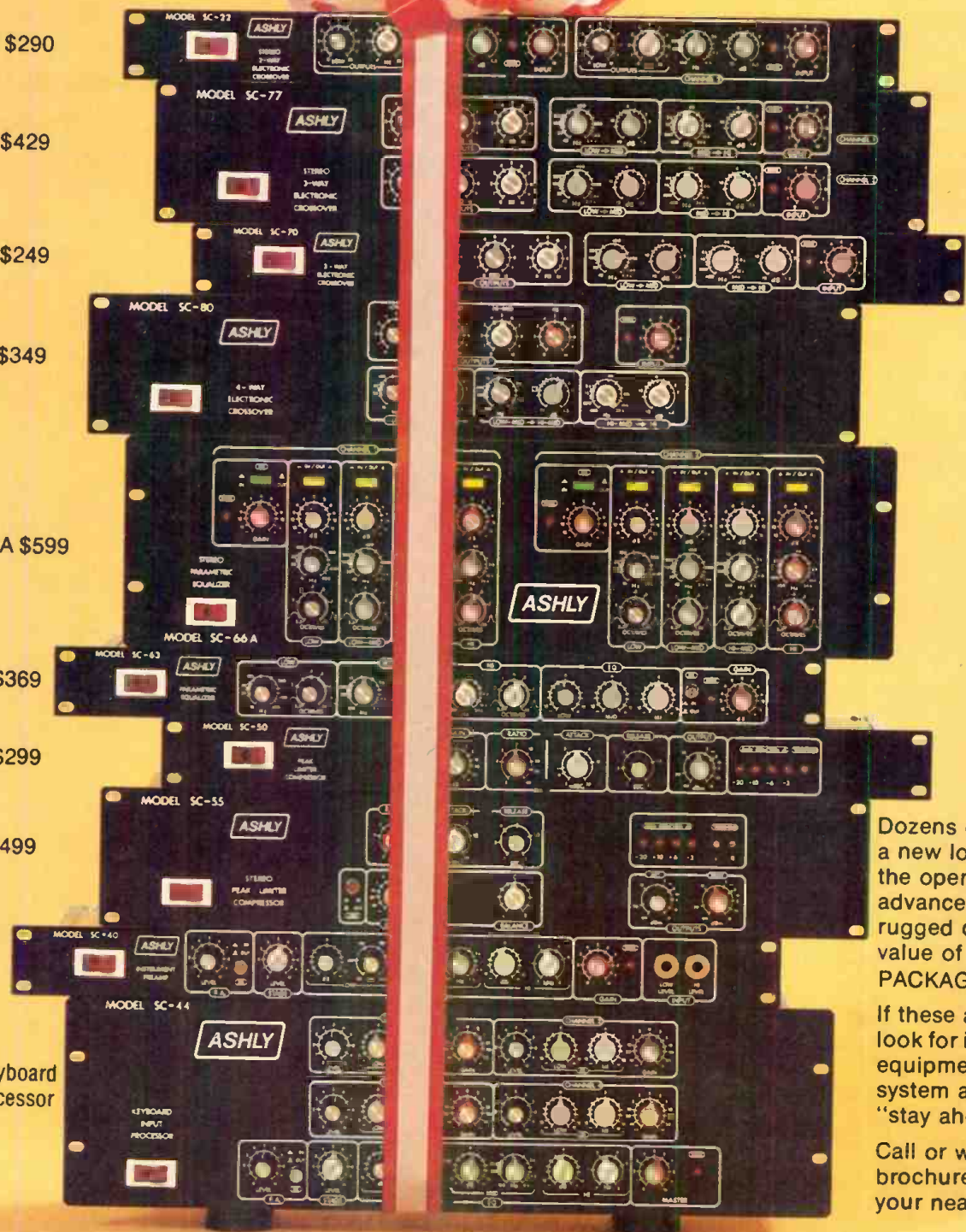
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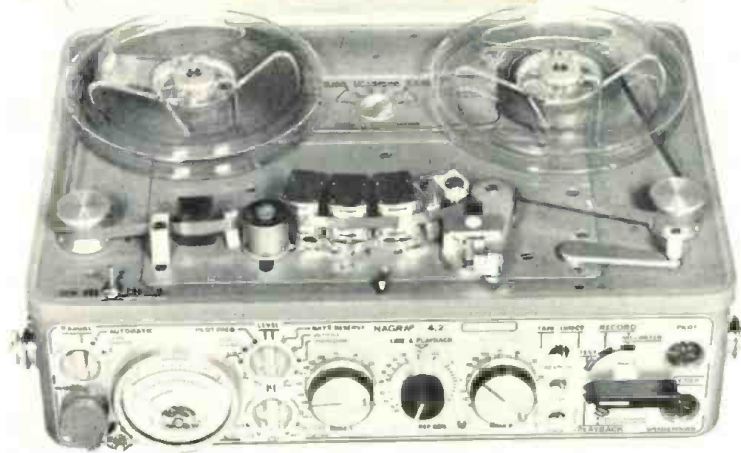
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Nagra

by John Lord

Being identified as a "sound engineer" sometimes leads to invitations to visit unfamiliar territory, such as recording sound for an odd TV spot or documentary. In this article, we will try to give an experienced engineer some of the background needed to get through a first job as a movie sound man.

For more than ten years, the most ubiquitous piece of equipment in film sound

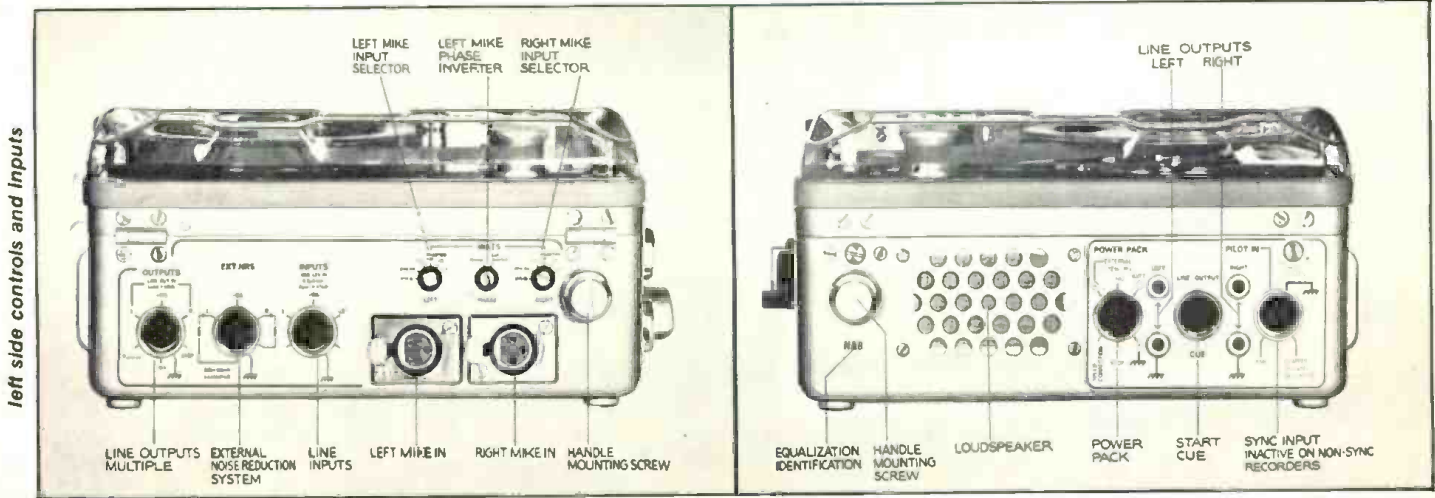
recording has been a Swiss-made, battery-operated quarter-inch recorder called the Nagra. Although it has a worthy competitor with unique advantages of its own (the Stellavox, which is lighter and takes interchangeable head nests), the vast majority of all movies, from *Star Wars* to student films, are recorded on the Nagra. Any introduction to recording sync sound for films is thus necessarily an introduction to this excellent machine as well. What follows refers to the two commonest Nagra series, the IV and 4.2 models. (What follows does not apply to recording for videotape or sound-on-film newsreels, which are completely different, non-Nagra bags.)

Physically, the Nagra is an aluminum box about thirteen inches by nine-and-a-half, and four-and-a-half inches deep. With tape and batteries, it weighs about 14½ pounds, or approximately a ton after twelve hours of walk-around documentary. The tape deck is

on the top surface, protected by a hinged clear plastic cover. With the cover closed, the machine accepts 5-inch reels; open, 7-inch. An accessory cover is available that permits 7-inch reels to be used with the cover closed, but because the cameraman must reload after eleven minutes, 5-inch reels are ordinarily sufficient. In the Nagra III, the cover had to be raised to disengage the puck; this is not necessary on the IV. For horizontal, stationary, or tabletop use, another accessory containing an auxiliary motor permits the use of 10½-inch reels.

On the tape deck itself are two controls: a rotary multi-pole switch that selects tape speed (3¾, 7½ or 15 ips) and tape type (standard or low-noise); and a three-position toggle switch that activates rewind and fast forward. All other controls, inputs, and outputs are on the sides of the box. Basically the left panel has the inputs; the front panel the major controls, and the right

John Lord has produced many 16 millimeter films and recorded sound for many others. He was formerly in charge of product development for CBS's Educational Film arm. For the past ten years he has headed *Paldela*, his own production company. He has also consulted various organizations on producing media for training purposes.



panel the output, the pilot-in, and a loudspeaker. More about these later. The bottom and the back panel are blank; the machine can be operated resting on either of these surfaces, or in fact, in any position. On the side panels are substantial posts with nuts, which will accept a carrying strap or a rigid handle. In use, the handle can be folded under the machine when it's sitting on a table, which tilts it up and gives a better view of the meter. Nagra also supplies several different types of leather cases. These are sturdy and have a very workable series of flaps to uncover the inputs, loudspeaker, and so forth. Changing batteries is almost the only operation that requires removing the machine from the case. In addition to protecting the recorder from scuffs and dust, the leather covers add considerably to unobtrusiveness in documentary situations.

Achieving "Lip Sync"

The most fundamental problem in talking pictures is keeping the picture and sound running together — "in sync." The margin for error is small; during one eleven minute run of the camera (not unheard of) an error of sync greater than one twenty-fourth of a second will be noticeable to an audience. This is $\pm .006\%$, and is barely usable. Ordinary tape recorders do not reproduce time durations with this degree of accuracy. The capstan motor may change speed (even if it's synchronous; the mains are not an accurate source of 60 Hz in the short run, only averaged over the long run); the tape stretches; the tape slips between capstan and puck.

For years, the only way to overcome these problems was to record on magnetic film perforated with the same holes used on the photographic film, and driven at the same speed. Afterwards, the perforated picture and sound can easily be mechanically coupled and run in sync, and stretching and slipping are not problems. Film editors continue to use perforated mag film, since it makes it possible to make cuts by physical

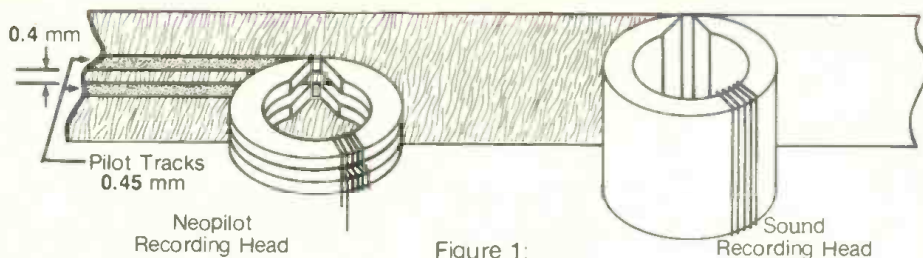


Figure 1:
NEOPILOT SYSTEM

splices that, without perforations, would require SMPTE time codes and very sophisticated equipment. However, the size and weight of even the lightest professional mag-film recorders made the production of certain kinds of conceivable sync-sound films physically impossible — not to mention problems of cost and sound quality.

Quarter-inch was the obvious solution, if it could be made to run in sync. Many engineers started to experiment with schemes to replace the location mag-film recorder; notably, in this country, Colonel Ranger.

Meanwhile, a Polish refugee in Switzerland named Stefan Kudelski had set himself the task of designing the finest portable recorder possible. His first efforts — still usable — were powered by clockwork, but their potential application to film was obvious. Gradually — abetted in part by the fact that the machine was distributed in Hollywood by an exceptionally able and conscientious sound engineer, Loren Ryder — the Nagra became the world standard film recording machine. Part of its success was due to the solution to the synchronization problem which Kudelski adopted and reliably implemented.

Basically the answer lies in recording a precise time signal on the tape at the time you record the sound. Then, on playback, by referring the recorded time signal to a

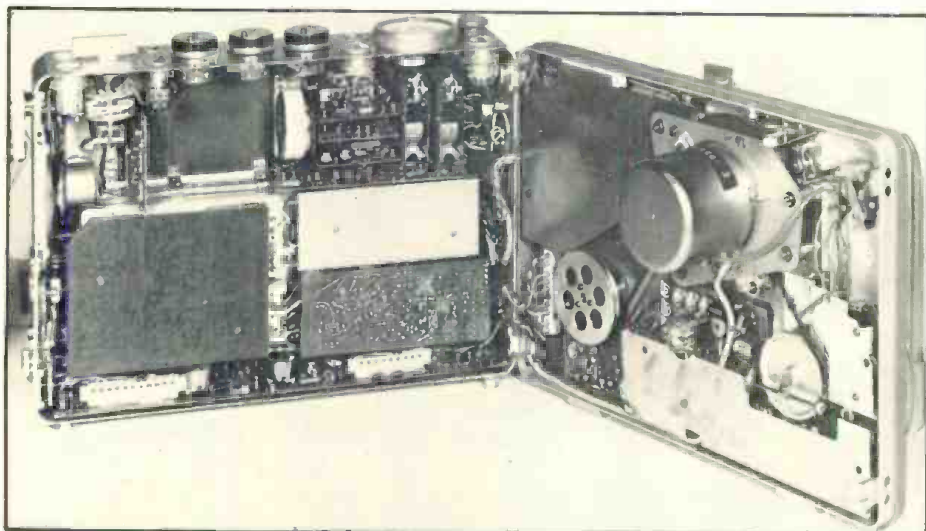
new but identical reference time signal, we can reconstruct the timing of the sound (and transfer it to perforated magnetic film for the editor's use). In the present-day quarter-inch monaural Nagra, this time signal is recorded and played back by a fourth head, located between the record and playback heads. This head has two gaps, each .45 mm wide with .4 mm between them, down the middle of the tape. The coils of these gaps are wound 180° out of phase, so that the signals they lay down cancel each other out when a full track head plays back the tape (See Figure 1). The correct name for this system is neo-pilot, but you will usually hear it referred to by the name of its predecessor system, pilotone.

Chances are, if it's your first shot at this type of work, it isn't your own Nagra (they go for \$4,000-up). Since the machines come in many different configurations with different internal modules, the first thing to do on obtaining the machine is to confirm what features it has. If it hasn't got four heads, you do not have a machine equipped for recording film sound. The fact the case says Nagra doesn't mean the recorder is equipped for sync sound recording.

In this country, the time signal we want the neo-pilotone head to record is as pure a 60 Hz sinewave as possible, though the Nagra has a built-in filter that allows it to make use of a signal with as much as 20% distortion. (In Europe, it's 50 Hz; guess why.) There are three conventional sources for the neo-pilotone signal.

Method One: Mains

If the camera is using a synchronous motor (its speed then depends on the frequency of the mains) we can derive the signal from the mains using an appropriate transformer and load. In this case what we are recording may not be 60 Hz, but 58 or 61 or whatever, but that's okay, because in that case the camera itself will also be running slow or fast. Nagra makes a box called the ATN, which is a transformer that supplies the pilot signal and can also serve to power the recorder from the mains. (Perfectionists consider this a bad idea because line transients may in the rare case affect the recording.)





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The pilotone signal is taken from the two brass banana-jack sockets on the end of the ATN, and fed to a four-pin Tuchel or Binder socket at the extreme rear of the panel on the right side of the case. (All the mike sockets on the Nagra are standard three-pin female Cannon-style XLR sockets;* line and grounds are banana-jack sockets, and everything else is DIN.

In making up sync cables, it is important to use a plug with a rotating, threaded outer shell (Binder-Tuchel 3300 001 7648) that can be screwed into the socket. There are other connectors which have the same pin arrangement and will work electrically, but don't give the secure mechanical connec-

**Nagras manufactured for the American market differ somewhat from those used abroad — in the equalization curves, for example, which are NAB here and CCIR there; and in the mike sockets, which are female here and male there. The difference that can really get you confused is the 50 Hz - 60 Hz business, which is reflected in the different versions of the crystal oscillator and the QFM meter. All crystals are switchable by switch or jumper wire. Worry about this only if you have a machine with a history of use abroad, or of use here for an overseas TV or documentary unit whose output edited in Europe.*

tion that is essential.

Note that it is important that the ATN and the camera be deriving their power from exactly the same source! In a home this can be taken for granted, but not in a military or industrial setting, or even a movie location, where one extension may be connected to Boulder Dam and another to a generator parked down the block. As a matter of routine, always plug your ATN into the wall plug used for the camera.

Deriving the signal from the mains has two advantages. First, it is technically cheap and simple. Second, any number of cameras and recorders can be used simultaneously. Note, however, that because the mains frequency is usually not exactly 60 Hz, you cannot rely on drawing the pilot signal from the mains if the camera is running on crystal sync (to be explained below).

Method Two: Cable Sync

The needed 60 Hz can be derived from the camera through an umbilical cable connecting the camera with the recorder's pilot signal inputs. As long as we have this cable anyway, we can throw in a few extra conductors which can be very useful for other purposes, such as an intercom and slating.

The 60 Hz can be achieved at the camera in one of two ways. The old way was to attach a small generator to the camera

motor, wound and geared in such a way that when the camera is running at sound speed — 24 frames a second — the generator is putting out 60 Hz. Of course, as the camera comes up to speed it will put out a frequency sweep. This can play havoc with some transfer equipment, so if you are using this system it may be wise to start the recorder after the camera has started. The second method is to build a crystal oscillator into the camera. A servo system ties the camera motor to the oscillator, and a frequency divider/filter produces 60 Hz which can be fed to the recorder.

There are several potential pitfalls with this system. The sync cable itself is highly subject to failure, much like a mike cable that people walk on and twist at the connectors all day. Also, the camera connectors are not standardized, so you need a particular cable for each model of camera. Get two cables and test them before the day of the shoot.

In some situations, especially fast-moving handheld documentaries, it is simply impossible to get around the cable handling problem. The presence of this long wire adds unwelcome opportunities for RF pickup and ground loops.

Using cable sync it is impossible to make a multi-camera/one-recorder set-up; to use one camera but many recorders is difficult (because unorthodox) but possible.

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Method Three: Crystal Sync

A temperature-controlled crystal oscillator or tuning fork is built into the camera, and a second oscillator is built into or attached to the recorder. In theory the oscillators should be matched before the shoot; in 16 mm practice this is rarely done because if both have been properly maintained (i.e., you got them from a reputable rental house) they never seem to differ enough to matter. With this system there is no difficulty in running any number of cameras and recorders together, at any distance. It is by far the easiest and safest way to go.

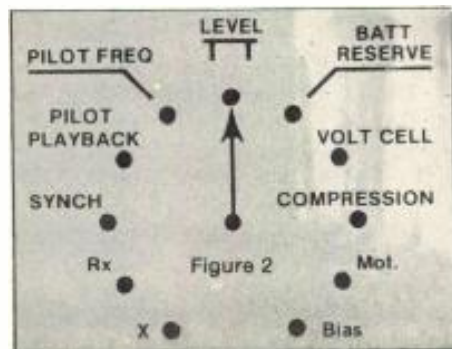
To eliminate one possibility for human error, Kudelski has not provided a switch for crystal sync. Instead, the signal from the internal crystal oscillator module is fed to the one pin of the pilotone connector socket. To feed the signal back to the recorder, you need to bridge pins 3 and 4, which can be done with a dummy plug (neatly labeled crystal sync) available from Nagra. Without the plug, you are not recording sync! Moreover, not all Nagras have the built-in oscillator — check this when you obtain the machine.

Let us now suppose you have a source of pilot signal. How can you monitor it to be sure it is being, or has been, recorded?

In the upper right hand corner of the front panel of the Nagra is a small indicator marked "pilot." When the Nagra is switched on and a strong enough pilot signal (.5 to 25 volts) is supplied, this indicator will show a white cross.

Better information is available if the recorder is equipped with two optional internal modules, QFM and QSLI.

The QFM module prevents the white cross from appearing if the frequency of the pilot signal being fed is off by more than 5%. This can be useful with cable sync, for example, where a slow-running camera will make the sound unusably low-pitched. The QFM provides another feature. On the front panel of the recorder, to the upper right of the meter, is a multi-position selector switch for the meter (Figure 2). One position is marked "pilot frequency." With the switch in this position, and a QFM module, the needle indicates the frequency of the pilot signal: +4% on the left, right on (with an accuracy of about .1%) in the center, and



- continued on page 54 . . .

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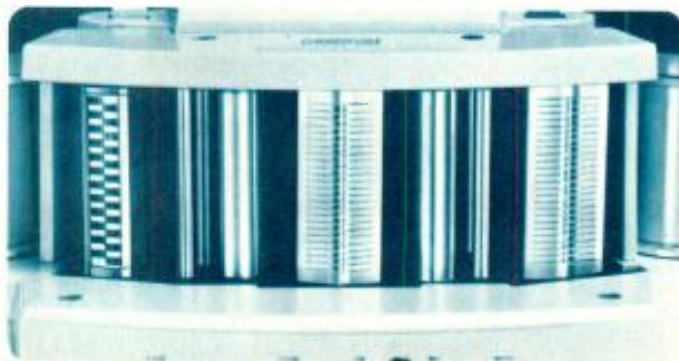
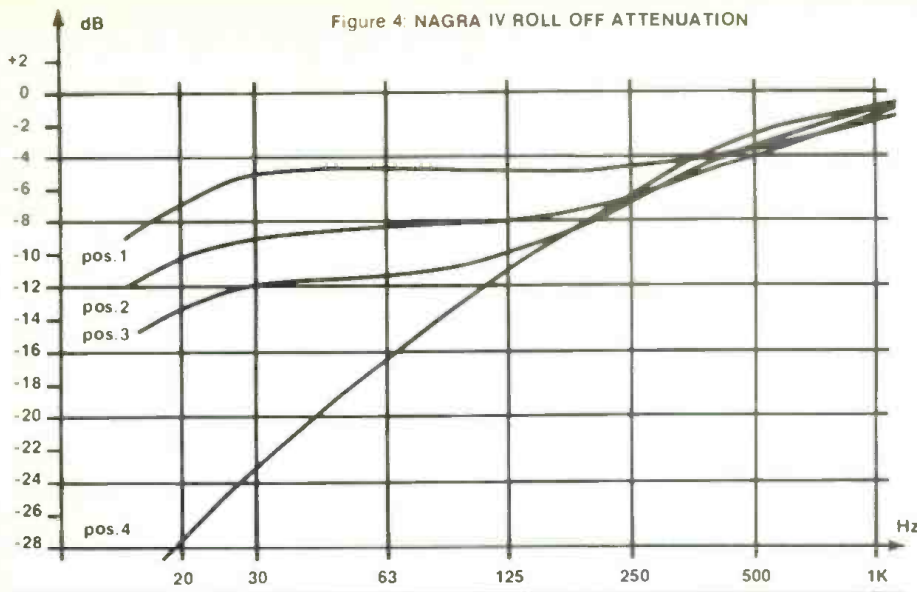


Figure 4: NAGRA IV ROLL OFF ATTENUATION



+10 power as well as a 200-ohm impedance for dynamic microphones. The variety of preamps that have been made means that you must find out whether the preamps in the machine are suitable for the mikes you intend to use.

Levels for the two mike inputs are controlled by the two outside pots on the front panel (the middle pot is for line level). The markings provide a sort of arm-waving estimate: if the pot is set at the 80 mark, a 80 dB sound level at an average mike with an average preamp will produce a 0 dB reading on the peak meter. The finer divisions clockwise after 85 are intended as a warning that beyond this point amplification of the floor of mike and preamp noise is contracting the dynamic range. Note that the Nagra has no switchable mike pads.

A third input is also available by connecting an outboard preamp (called a "BS-II") to the socket marked "acc." The preamp will be powered by the recorder.

Certain condenser microphones can also be connected, by appropriate adapters, to the "accessory" socket, and of course with an appropriate outboard preamp, a mike can be connected to the banana-plug socket line-in. Thus a total of three inputs can be mixed without recourse to an external mixer, and this is usually sufficient.

The Nagra also has facilities for a certain amount of equalization, specifically, low end roll-off. This is an important feature for film work for a couple of reasons.

In the first place, because the sound will be cut up in little pieces — individual words, even — and reassembled in an order that may bear little relation to the order in which they were recorded, consistency throughout a scene is highly valued. At the same time, the mikes used are directional. If the speaker-mike distance can't be kept constant, for example in interviews, some roll-off helps the bass proximity effect.

Second, up to a point intelligibility is more

important than fidelity. The lows contain very little articulatory information, but they do contain such noises as fluorescent hum and wind noise. Roll-off thus improves intelligibility (see Figure 4).

Finally, compare music recording and film sound in terms of the relative differences in the loudness of the live sound at the mike and the reproduced sound at the viewer's/listener's ear. Live music is loud and it's played back loud — probably not even quite as loud as it was live. Speech, on the other hand, is not loud — a whisper, maybe — but in the theater it's played back loud. This in itself is a form of equalization (remember the Fletcher-Munson curves). To restore a natural sound to the voice requires rolling off the low end. If we know we're going to do this anyway, we might as well start (gently!) at the recorder, so that we can boost the levels of what we do want and reduce intermodulation distortion.

Equalization is provided by a small rotary multi-position switch beneath the meter switch. Here there is substantial difference between the IV and the 4.2. In the IV this switch had six positions: flat, four low frequency attenuation settings, and a position which injected a 400 Hz signal at -8 dB into the record chain (see Figures 5 and 6). In the 4.2, the tone generator (1000 Hz at -10 dB) is a separate pushbutton between the pots for line and mike #2, and the equalization switch now has one flat position and five different roll-offs.

The meter on the Nagra is not a VU meter, but a peak-reading meter (modulometer). Maximum excursions can go out to the +4 of the meter without saturating the tape, but that's it. We have already mentioned the meter selector switch, to the

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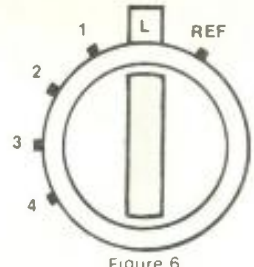
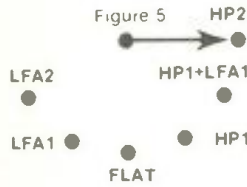
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upper right of the meter. Bear in mind that if this switch isn't set to "level" you may be monitoring motor current instead of level.

Notice the "compression" setting of the meter selector switch. This is used with the automatic level control, which is controlled by a rotary switch to the upper left of the meter. In the "manual" setting the ALC is switched out; in the setting marked "1" it controls mike input 1; in "2," both mike inputs are controlled.

With the ALC switched in and the meter selector switch on "compression" an excursion of the needle all the way to the right indicates 30 dB of gain reduction. If you had a bad experience with the ALC on the Nagra III, don't write off this feature — it's a vastly different circuit and works quite well.

If noise reduction is desired, dbx units have been made which bolt to the bottom of the Nagra and are powered by it. They are, however, no longer available from dbx.

To power the recorder, we need a dozen size D dry cells in the fiberglass well on the bottom of the recorder. There are several schools of thought about what is the most suitable battery. Many large studios use the cheapest fresh batteries available from a reputable manufacturer and discard them every day. This is reliable but expensive. Some prefer nickel cadmium cells, and Nagra makes an accessory called PAR which can be used with the ATN to recharge ni-cads without removing them from the recorder. This is no place to go into the treacherousness of ni-cads, but you should be aware that there are two distinct size D ni-cads: the consumer kind, with a capacity of 1.2 ampere-hours; and hi-caps, with a capacity of 4 ampere-hours. You ought to get hi-caps. My own preference is for "alkaline energizers," because their performance is very predictable and they are economical *if not discarded prematurely*. The Nagra makes two provisions for monitoring the power supply. If the meter selector switch is placed in the position marked "volt/cell," the meter will read 1/12 of the total battery voltage. If it is placed in the position "battery reserve," it will indicate the difference between the voltage the Nagra needs and the voltage available from the batteries. As long as the needle rises into the thick line marked "battery reserve," the machine will do its job and the batteries, if not rechargeable, can continue to be used. If

volts/cell falls below 1.0 volt, however, some of the machine's specs are slightly compromised, especially at 15 ips. In addition, some rechargeable cells can't recover from a really deep discharge, so the "volt/cell" setting warns you when this is happening. It also lets you know if something is wrong with the recorder, because if "volts/cell" is okay and "battery reserve" is not, the recorder is trying to draw too much power. Suspect the motor. The position of the meter selector switch marked "mot" can be used to measure the current drawn by the motor. If the motor is run without tape and without engaging the puck, the needle should indicate between .2 and .3 volts on the battery voltage scale. If it's higher, clean the commutator.

Some directors call for frequent playbacks of tapes. The rewinding and loudspeaker amplification this requires uses up batteries fast. In any case, you should always have a backup set available.

The 4.2 also has a low voltage alarm system in which the "AR" indicator will go black when the voltage is insufficient.

Several other items on the front panel require some discussion. To the left of the meter is the headphone jack. Fifty-ohm headphones of very high quality should be used. They also must be of the "closed" variety so that you do not hear outside sound sources mixed with what you hear through the mikes or off the tape. Next to the socket is a small pot, hopefully of the screwdriver-adjust type. Set this at a level which is comfortable for a good signal level for recording and then leave it alone. Constantly monkeying with the setting robs the headphones of their usefulness as a quick signal level reference.

To the right of the mike #2 pot are two toggle switches in the IV, three in the 4.2. The upper one is a A/B switch, so that you can monitor direct or off the tape, and is clearly marked. The middle switch on the 4.2 is spring-loaded, and allows you to switch the meter only over to playback off the tape during recording so you can confirm the recording without interrupting your monitoring.

It is also useful for azimuth check when used with the built-in reference oscillator. To accomplish this, depress the oscillator button with tape on the machine and recording. Deflect the spring-loaded switch

to tape position. If the needle on the modulometer drops, azimuth is out of line.

The switch at the bottom selects the internal battery supply or an external (e.g., ATN) supply. Make a habit to always leave this switch in "external" when not using the machine. Many batteries will rupture and discharge corrosive chemicals if they are left under load indefinitely.

Finally, on the lower right we come to the switch which makes it all work, the function selector. The northwest settings of this switch are all "record" positions; the southwest positions are all "playback." There is no interlock to prevent one from absent-mindedly throwing the machine into record when you meant to turn the switch to playback. A mechanical connection between this switch and the deck closes the puck a final millimeter that brings it into contact with the capstan, setting the tape in motion.

There is a big difference between the IV and 4.2 in the record positions of the function selector. In the IV, the position after "test" was what Kudelski called the "F" (Fade) Device, or Mickey Mouse Eliminator. Placing the switch in this position started everything but with the recorded signal 30 dB down. Going to "Record" position then gave a one second fade-in to normal levels. You could get around this by not pausing in the Fading position, and the "speed and power" indicator didn't come on in "F." Nevertheless, some important recordings ended up 30 dB down and Kudelski, with his attentiveness to sources of human error, dropped the feature in the 4.2s.

In the 4.2 the position just before vertical, formerly occupied by the F Device, is now "Record with Limiter." Full vertical is still "Record." The limiter feature is not the automatic level control, which is a compressor. Offhand, I cannot think of any circumstances so unanticipatable that I would want to use the limiter — particularly with the ALC available.

In the lower right hand corner of the front panel, beneath the pilot indicator, is a similar indicator labeled "AR" on the IVs and "Speed and Power" on the 4.2s. This indicator will show white if the function selector switch is in playback or record (but not "F" in the IV), the power supply voltage is sufficient, the motor is not drawing maximum current, and the tach head on the motor is not wowing out of tolerance — all indications that power and speed are okay.

The threading of the Nagra is extremely straightforward; truly straightline. Pulling the lever near the right tension roller retracts the puck, the flutter roller and the tape guide. Lay in the tape and push the lever back. Done! Note that the reels are held on the tables by round nuts. Because it's possible to lose these nuts, it's a good idea to have a pair of extras with you.

Incidentally, the nuts will fit over the post on the lever used to close the puck — while threading the machine, this post provides a convenient place to park the nuts.

Choice of tape deserves consideration. The average material recorded for films doesn't resemble the average material recorded in a music-oriented studio. Dialogue, unlike music, has big holes; in these holes, print-through becomes painfully obvious. To alleviate this, a tape optimized for low print-through is chosen; specifically, Scotch 208. Unless you get specific word otherwise concerning the particular machine you're using, it's a safe

bet that the "LN" setting represents biasing and equalization for 208. (209 is used when no opportunity to re-thread is likely.)

After threading, a head-end identification must be recorded on each roll. Typically, this requires identifying the production company's name, the name of the production, the date, the sound roll number, if possible the number of the camera roll to which this roll of tape syncs, and finally the level of the reference tone which follows, which is -8 dB on a IV (position of the equalization switch) and -10 dB for a square wave (-8 dB on sine wave) on a 4.2 (pushbutton near the pot for mike #2).

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Record several seconds of tone, enough to give the guy doing the transfer to mag film time to set his level; then record a few seconds of silence so you won't have tone printing through on the head of the first scene.

Slating

Incidentally, it is often the soundman's responsibility to keep the camera log, which is a list of all scenes and the takes for each scene, with indications of where sound and camera rolls were changed.

Now we are ready to use the Nagra to record a take. That might begin this way:

Director: "Roll sound."

You turn on the recorder, quickly check on playback to make sure all systems are go. They are.

You: "Speed."

Director: "Roll camera."

Cameraman: "Rolling."

Director: "Mark it."

A person with a clapperboard: "Scene twenty-three apple take two."

Whack! He slams the sticks together, and continuing to hold them tightly together, skips out of the scene. The cameraman adjusts focal length and focus.

Director: "Action."

Why all this? Mainly to give the editor as easy a way as possible of locating a

simultaneous point on both picture and track. On the track, it is the sharp attack of the whack when the sticks come together. On film, it is the first frame on which the two hinged halves of the sticks are together.

A competent slater will have the sticks apart all the time the camera is rolling up to the whack, and keep them together all the time after that. No bouncing, no casual opening. This way, the editor can pick up any frame of film and say whether it comes before or after the slate. There are many other fine points of slating — tail slates, MOS slates, and so forth, which are the slater's responsibility and needn't concern you. But some points will concern you.

One is the problem of misslates. For various reasons it may sometimes happen that a slate is recorded which the camera doesn't photograph. If this happens, the cameraman should immediately call for reslating, usually with the same scene and take number. If this happens, be sure you voice slate, shouting if you have to, "second sticks" on the tape prior to the second slate. If recorder and camera are shut off before the take, best to change the take number. Note on the camera log all second slates, or that no slate was photographed for the preceding take. Sometimes the person doing the slating will even read the number on the slate wrong. You have to catch these things immediately, preferably both written

on the camera log and audibly on the tape. Otherwise an editor might waste a lot of time hunting non-existent sound. Unlike failure to record a proper sync signal, failure to record a good slate is not an irretrievable error — but it does create a lot of unnecessary work. The editor will probably let the producer know what a lousy job you did.

In some situations, the traditional clapperboard is awkward or impossible. Its place can be taken by several techniques or devices.

A common documentary technique is to tape to the side of the Nagra a tablet of paper whose sheets are pre-numbered with felt pens. At the end of each take, the cameraman turns to the soundman, photographing the pad, and the soundman says the number showing and pats the end of the foam windscreen on the shotgun mike. Then he tears off and discards the number. Obviously, in doing this it's important to give the camera a clear view of the point of impact between hand and mike. Another technique is to clap hands, again so the camera can see air between them till the moment they close.

If you are using cable sync, far more elegant possibilities present themselves. Some cameras are equipped with a light in the camera's film gate, which comes on for about the first second of camera start-up, fogging the film. At the same time, +10 volts (6-14 for the IV, 4-14 for the 4.2) is sent to pin 2 of the pilotone socket through the sync cable. This activates an oscillator in the Nagra that lays down a "bloop" or "bloop tone" on the tape. The light and tone go off simultaneously, and this provides a sync point for the editor.

A pitfall of this method is that some camera motors have a switch to defeat the bloop tone. This is useful in documentaries when the camera is only turned on as something good starts to happen, and the producer doesn't want the unrepeatable sound obscured by a bloop. Unfortunately, this switch can be thrown accidentally, usually when the camera is covered with a heavy cloth silencing wrapper (called a Barney) which is often used in confined quarters. As the bloop system is ordinarily automatic, there is, unfortunately, a natural tendency to take it for granted, especially when a Barney's being used. You must listen attentively for the bloop and confirm it's working on each take.

There are also a few good devices available now which provide electronic versions of the pad of numerals, but connect directly to the bloop oscillator: i.e., push a button, liquid crystal take numbers appear on a box taped to the recorder while the bloop oscillator comes on. This can't be accomplished, so far, with LEDs (too dim) or incandescent lamps (too much thermal inertia).

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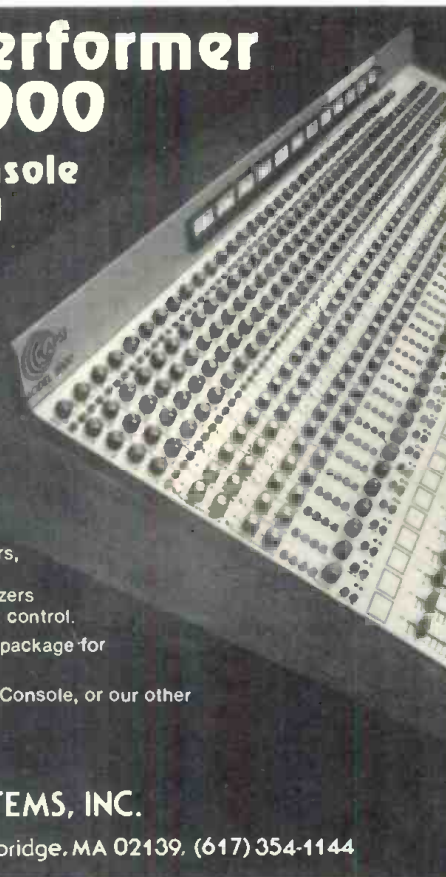
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Film Sound Peculiarities

As an experienced engineer, you won't need any advice about mike choice or placement. A few more words on the peculiarities of film may be helpful.

The visual takes precedence over the sound. In practical terms, this means the cameraman has the ultimate say on where you put your microphone. Get to know the cameraman so that the two of you can communicate honestly when compromises have to be made. Lights can sometimes be altered to eliminate shadows that reveal the mike's presence. In a small production, you can arrange for the cameraman to "give you a frameline" on each shot. Move the mike in on its fishpole until the cameraman says he sees it ("it's in"), then pull it just out. Even a few inches closer can help a lot. Remember, you can get closest to a speaker from directly above or below. The photograph area is a rectangle, not a circle, and off to the sides at the same distance puts you in the corner of the frame.

If worse comes to worst and there is no possibility of getting usable dialogue on a location, filter and get the most intelligible sound you can. Your guide track will be a great aid to the actors in a dialogue replacement session.

It's important that the background noises

throughout a scene be homogeneous. The airplane is the most frequent offender. Suppose an airplane is heard in the background while we are filming a long shot. Now we film the closeup, and the airplane is gone. Later the closeup is intercut with the longer shot. The airplane vanishes every time we go to the closeup! Of course this won't do. In filming the original long shot, we will have to wait until the plane goes away if we want to use the original sound.

Another consideration is that if new lines are later recorded in the studio to replace some of the dialogue, or cutaways are added which were shot "Mid-Out-Sound," the editor will need matching background presence (or "room tone"), to play behind these scenes. So, for each new mike set-up, be sure to record a minute of room tone. This material should be voice slated "begin room tone" and "end room tone."

It is customary not to rewind completed rolls of tape for two reasons: first, to reduce print-through, and second; because the Nagra rewinds rather slowly. If you do need to rewind, shift the puck lever full out (clockwise), throw the toggle switch on the extreme top left front of the deck to "rewind," and turn the function selector switch to any position. Fast forward is even slower, since it is done with the puck engaged and the electronic governor disconnected. Fast forward can only be

done with the function selector switch in the playback-loudspeaker position, with the switch on the top left front of the deck thrown to the right.

That completes a basic run-down on the fundamentals of using the Nagra to record film sound. It is a remarkably well-conceived and well-made machine, one of the most (maybe *the* most) reliable portable recorders on the market. People who equate portable with disposable and inferior are appalled at the price, (Kudelski's answer to the cassette recorder, the reel-to-reel SN, is about \$3,000). However, the Nagra's price is very comparable to the price of studio machines with comparable performance: signal-to-noise, wow and flutter, etc., excepting only the slow rewind and fast forward. And Kudelski is rumored to have a new version in the wings, perhaps three-motor.¹ If that's true, we may be seeing these little aluminum boxes as master log recorders in a lot of small studios.² Say it can't happen? That's what the guys with the mag film recorders said twenty years ago. With the Nagra, small is beautiful. □ □ □

Editor's Note:

¹ ISL Recorder now available with full track mono record/play, three motors and electronic tensioning.

² IV-SL now in use as a mastering machine in many studios.

Should you buy the new Sound Workshop 262 Stereo Reverb or should you retile your bathroom?

That's a tough decision to make. Perhaps you stay up nights pondering this very question. But please take the time, right now, to consider this important matter.

Think how great your voice sounds when you're lathering up in the shower. It's because the hard, ultra-smooth surface of the tile takes your normally lifeless voice and bounces it

back and forth adding depth and magnitude. It's called natural reverberation.

There are, and have been, devices available which simulate natural reverberation. But a professional quality studio reverb (that sounds as natural as your bathroom) used to cost well over a thousand dollars.

Sound Workshop introduces the new 262 Stereo Reverberation System... for well under a thousand dollars. We thought you'd like to know.



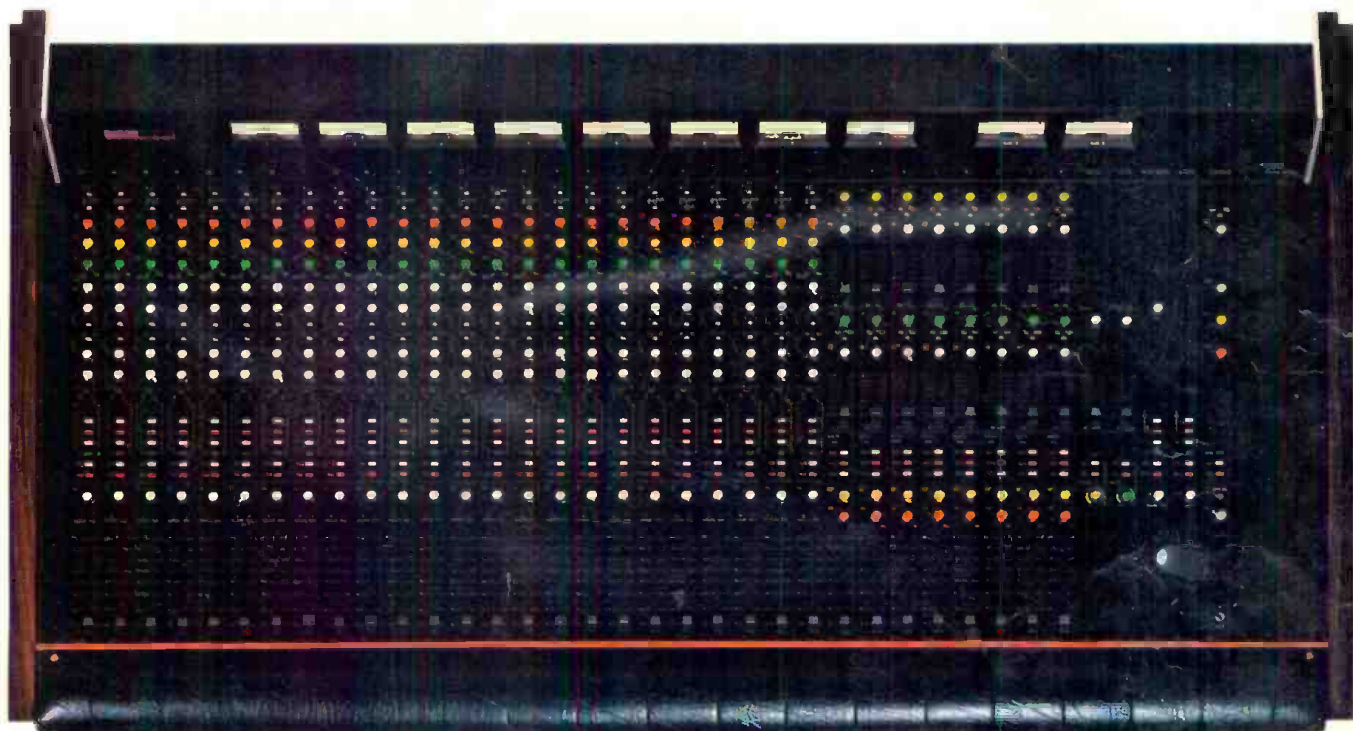
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Buying a big mixer can be very deceiving. From the time of delivery to the moment your board is operational, you can run into quite a few additional costs and frustrating time delays.

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From the discrete microphone pre-amplifier, equivalent input noise is -126dB (weighted). With one input assigned to one output buss, signal-to-noise is 76dB (weighted).

Formats are 16- or 24-channel input/8-buss output. Fully modular.



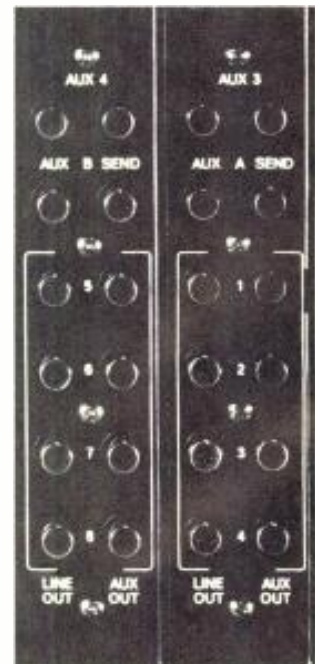
The Model 15 will drive any 16-track recorder and give you a vast array of mixing, monitoring and cueing capabilities. For example, the Cue mixing position can be fed by 48 sources simultaneously (all the inputs plus all 16 tape playback positions plus all eight echo receives).

Out of the crate, you'll have a lot more mixer in the Model 15 than you can get elsewhere for the money. Add your savings on installation (both parts and labor), and the Model 15 becomes even more cost-effective.

So think about the real, often hidden costs of buying a mixer. When you add it all up, we think you'll see the practical advantages of getting it wired with a Model 15.

The Model 15's functions, interior layout and complete specifications are described in our 10-page Product Information Bulletin. See your Tascam Series dealer or write us for a free copy.

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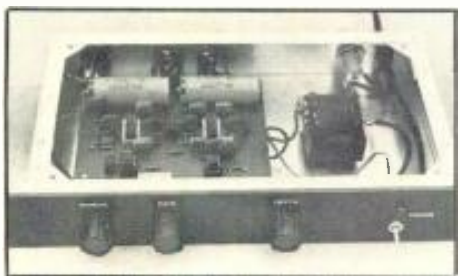
A STEREO SYNTHESIZER CONSTRUCTION PROJECT

by
Ethan Winer

There are many ways to create a stereo effect. If you were miking a piano, a string section, or some other large sound source, you'd probably stick up a pair of directional mikes and assign them left and right. But what do you do if you want to "enlarge" a lead vocalist? Or, how about other inherently mono instruments like an electric guitar or a synthesizer? Well, you could delay one side or use a Harmonizer or some other related gadgetry, but generally with this method, the stronger the effect you create, the more you'll jeopardize mono compatibility. A short delay will cause phase cancellations in mono, while longer delays can create a disturbing slap echo. (I personally happen to know some rock bands that would consider this to be a plus; though you'd never get away with it on a jazz purist or — gasp — an opera singer.) But seriously, an even better approach might be to simply EQ the two sides differently. Unfortunately, for a soloist desired up front and centered, the brighter sounding side will dominate. So what's really needed is a better method for changing the equalization — more than just adding top or bottom.

One method is to employ several transition or crossover points in the frequency response between the two channels. In other words, the low bass range will come out of one speaker, the high bass from the other. The low mid-range comes from the first speaker, and so on. We must be sure though, that the sum of the two channels always equals the original mono source if compatibility is to be maintained. You don't process the entire mix, of course; only the tracks that you want to enhance.

The black box wonder about to be described fulfills these basic criteria and more. The frequency crossover points can be varied either manually or automatically with a built-in, variable low frequency oscillator. The manual adjustment is useful for finding the best crossover points for a



— continued overleaf

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*Sierra/Billboard
Dinner for
Industry Leaders
Was AES Highlight!*



Sierra's Kent Duncan,
Dinner Co-Host

Top recording studio and equipment people gathered in LA Thursday evening during the AES as dinner guests of Sierra Audio's Kent Duncan and Billboard Magazine's Jim McCullough. Participants in the "east meets west" dinner

SHORT TAKES

54th Street's Booming

Nice to hear all the good things going on on 54th between B'way and 8th Avenue in NYC. Janet Rosenblatt's Sound Palace with 2 Golds already and solid booking, now readying another 24 track room.

Across the street, Charles Benany's Sound Works has taken over the location of ODO Recording with a complete overhaul and lots of new gear. And upstairs in the same building (254 W. 54th St.), Elliott Rossoff and John

Gomez report a strong surge in bookings for their automated Opal studio. (And watching it all from his lair across the street is Eventide's Richard Factor, maker of superb audio goodies for all the world! It's a busy street.

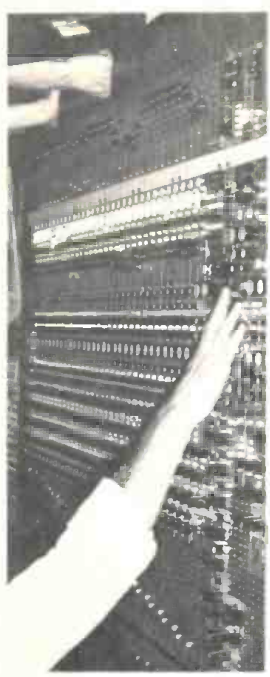
La Tierra Goes 24

Top-ranked NYC Latin studio La Tierra bites the bullet and goes 24 track. Our installation crew did the upgrade job on

OUR LOS ANGELES AES REVIEW (or . . . who stole the show at L.A.?)

Calling the show the way we say it, nothing new. A few new boxes, the usual hasty prototypes, but certainly no breakthroughs! Digital seems to be the buzz word, with none of the early users evidencing any enthusiasm. A slick new way to mount Auto Locators on MCI consoles caused more comment than anything else. Here are the show superstars from our vantage point. (Somewhat biased, we'll admit since we're dealers for all.)





MCI's "Ultimate" system demonstrations were packed . . . and why not? They had two 24 trackers sync'd with MCI's SMPTE Autolock, and the new 556-56 automated console working like a breeze. This probably is the ultimate step between current single 24 technology and that wonderful day when digital finally gets its act together. In the photo, MCI's Steve Beverley (l.) shows off the 556 to interested audience.



The "Miracle on 54th Street" continues to come up with at least one new box each show. This time it was the H949 Harmonizer with a whole array of new features and improvements. Eventide's Tony Agnello sets up a new effect on the new Harmonizer.



A & DR's Len Lewis (beard) and Nigel Branwell (standing) feeling rather jolly about the Scamp system as sales of the popular English modules continue to soar. Newly introduced at AES, A & DR's stereo Express Limiter was also a big hit.

the 16 track MCI setup and added 8 more tracks of Dolby. Best wishes to Jerry Masucci and all the La Tierra crew.

And up in Westchester County
Well-known musicians Jon Hammer and Gene Perla have finally retired their old Scully 8 track and replaced it with a shiny new . . . MCI 8 track! Gene says that 8 tracks are just fine for their Red Gate Farm studio, but they need that MCI sophistication and tape quality.

Scamp's Rolling, Too!
Recent deliveries of Audio & Design Recording's Scamp modular system include:
Regent Sound (NYC); A&R Studios (NYC); Sound Works (old ODO, NYC); Howard Schwartz Recording (NYC); Phil Ramone Productions (NYC). Scamp's Auto Panner, Expander Gates and Compressor Limiter fast becoming standards in NY area.

Digital Reverbs for Sigma and Soundmixers
First NYC area delivery of the Lexicon Digital Reverb went to Soundmixers, as Harry Hirsch continues policy of being first with the best. Meanwhile, in Philadelphia, Joe Tarsia's Sigma Sound received the first of their 3 Lexicon's on order. And from both studios, nothing but highest praise for the new reverbs.

And out in Lotus Land
A/T recently sold a previously owned MCI 500 console to Hal Zeiger's El Dorado Studio in Hollywood, Cal. Hal's an old friend, and it's nice to see an automated MCI console in this veteran studio. Good luck to all.

Allen & Heath's resident
U.S. demonstrator Chuck Augustoski shows off the remarkable new Syncon at A & H's always packed demo suite. Syncon consoles, loaded with 28 inputs, producer desk, and patch bay, still cost under \$30 K . . . and have better than 26 db headroom!

been announced for National's 730 Fifth Avenue facility, present home base for the 20-year-old firm.

SUMMERTIME IS RENTAL TIME!

A/T Rentals Manager Kurt Fleischer reports early bookings for summer rentals are heavier than ever. If you're going to need equipment for a remote gig or whatever, give Kurt enough advance warning to take care of your needs. A deposit (10%) works wonders.

Now available for rent:

- Trident Flexi-Mix 24 track
- BTX, MCI SMPTE Interlocks
- AKG BX 10 Reverbs
- Big Red, Little Red Monitors
- Mike Snakes, H/H 500 Amps

Rumor Mill . . .

What's the hottest selling used equipment this summer? (24 track recorders, according to our man in the control room, as sync 24 sessions spread like a good rumor!)

How cum those new discs from digital recordings seem to be missing all the highs? (Just one of the problems as hype struggles against reality in the confused digital world.)

Will used EMT plate prices take a nosedive as state-of-the-art variations hit the market? (You better believe it, and add KepeX, too, as Scamp system gate sales soar.)

When will studio owners realize the stupidity of having high priced recording engineers in the control room and bargain basement hacks in the maintenance department? (Not until they try to figure out why the act didn't come back for the next album.)

What's behind the NYC jingle studios move into music album dates? (Elementary, my dear Watson. The ad biz stops dead at 6 pm!)

and far ranging discussions included Harry Hirsch (Soundmixers, NYC), Howard Schwartz (of the studios of the same name, NYC), Dave Tieg and Tom Cahill (Atlantic Records, NYC), Ham Brosious (AudioTechniques, NYC), Mack and Danny Emerman (Criteria, Miami), Jeep and Joyce Harned, Lutz Meyer (MCI, Ft. Lauderdale, FL), Chris Stone (Record Plant, LA), Jim Stern (Fantasy Records, LA), like Benouin (Audio Industries, LA) and the hosts and their staffs. Based on enthusiastic comments of the group, repeats of the dinner on both coasts are a certainty.

WARNING!

If you plan to get a Lexicon Digital Reverb this year, better get your order and deposit in now. Our first 24 units are already committed and the next 24 will go fast, as sensational performance reports continue to come in from users. Price is \$6,900 and deposit required to get on the list is \$690. Send it now for late summer or early fall delivery.

Classified . . .

RECORDING STUDIO

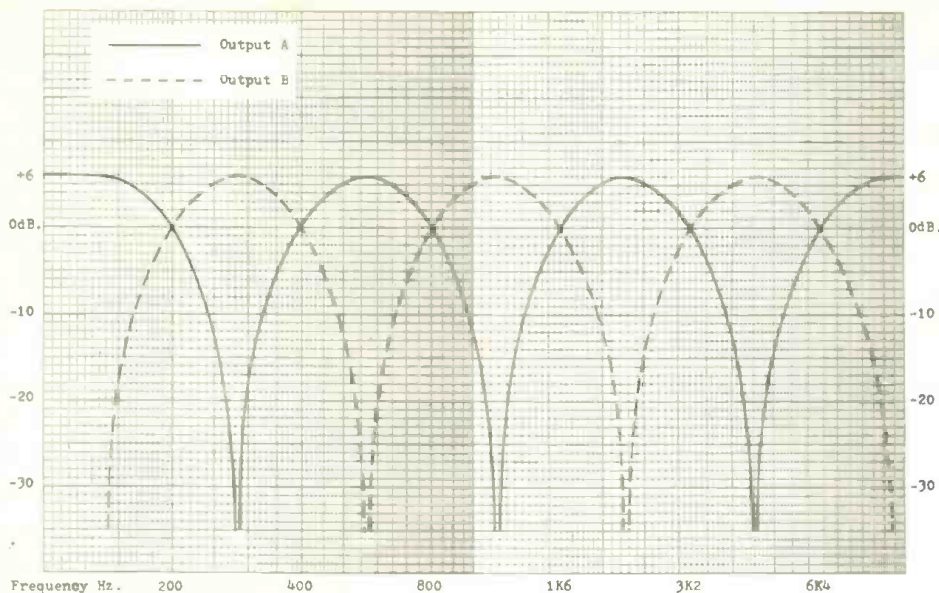
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- 1 Scully 282-4, Two Track 1/2", auto lifters, motion sense, console, sync. \$2,900

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given instrument or track. The automatic sweep provides a good rotating speaker sound while the stereo output further heightens the effect. If you use only one of the outputs, you will have a phasor similar to many currently on the market. This is not a true time delay type phasor, but then neither are many of the others. Incidentally, when you're using this for a phasing effect, try each output separately because the sweep ranges are different for the two channels and obviously the sound will be, too.

How It Works

As mentioned earlier, different frequency ranges appear at the two outputs, depending on the setting of the controls. To be a little more specific, the actual crossover points are as follows (it helps to look at the graph): Frequencies below 200 Hz are at output A, while the high bass from 200 Hz to 400 Hz is available at output B. We go back to output A for the mid-range from 400 Hz to 800 Hz, while the octave from 800 Hz to 1.6 kHz is at output B again. The crossovers continue on at octave intervals comprising a total of six transitions spread over a five octave range. Again, this entire set of dips and peaks is sweepable over a ten-to-one range. The lower limit occurs at 30 Hz, and the highest is at 9 kHz. The depth of the notches is also continuously adjustable from



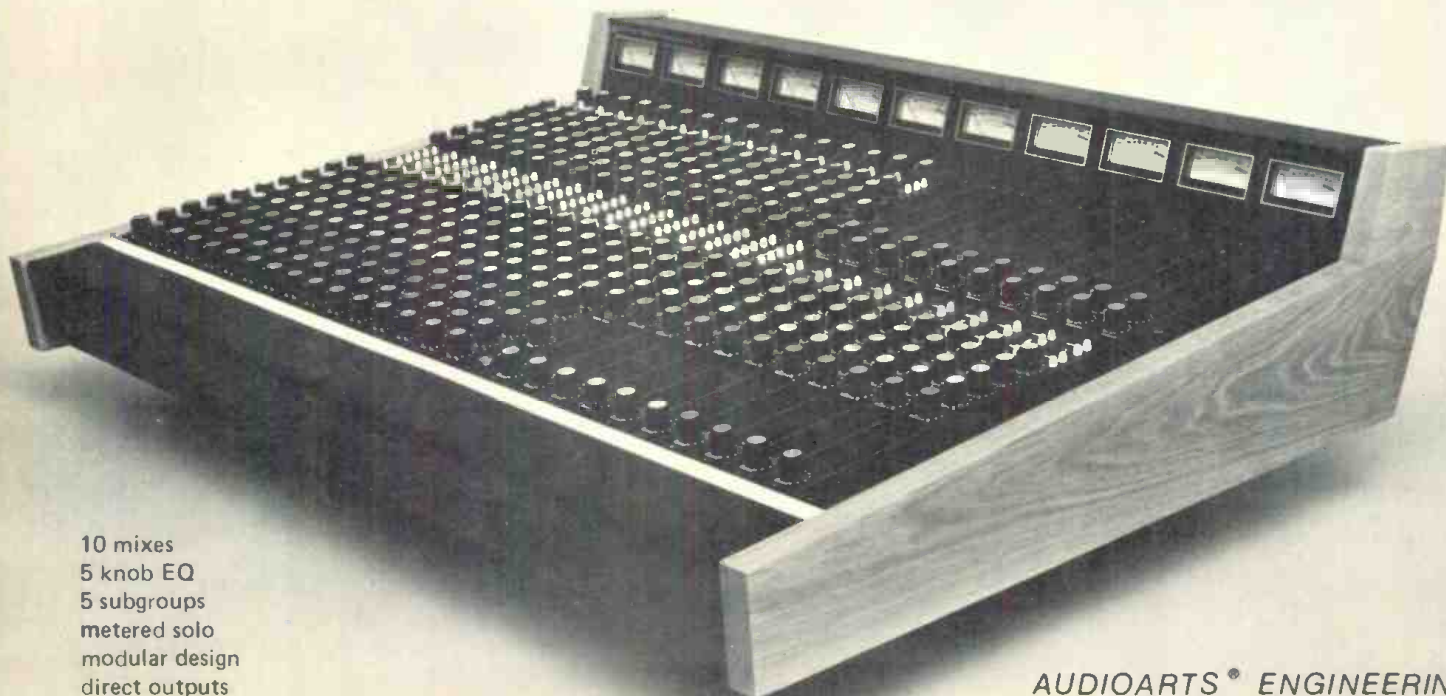
zero (no effect) to a maximum of near infinity. If you were to use 1% resistors in the final combining stage, you could get even closer to perfect notches, but a depth of 40 or 50 dB is really more than sufficient. The automatic oscillator rate is adjustable from about 4 or 5 seconds per sweep at the slowest, to 10 Hz or so which is probably faster than you'll ever need.

On the prototype I used a switch attached

to the rate control to select between manual and auto-sweep. Like a radio where you shut off the power by turning past minimum volume, turning counterclockwise past "slow" will disconnect the oscillator and engage the manual control. This potentiometer/switch combination is available at any radio supply store, as is the 10 uF non-polar capacitor. Naturally, you can use a separate switch if you want to. While I'm on the



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subject of parts, just about any junction type FET will work in this circuit. The FETs should all be the same type, of course, though matching is not necessary. Simply adjust the 10 K trimpot in the oscillator circuit for the smoothest sounding sweep. This is the only set-up adjustment required and can be easily accomplished without any test instruments.

How It Really Works

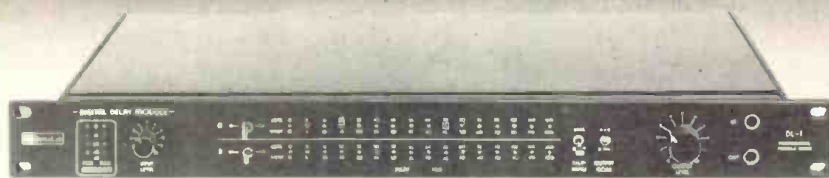
The signal at the input is first sent to a low noise IC op-amp configured for a loss of about 10 dB. This loss is needed to reduce the signal voltage present across the FETs, which will minimize harmonic and IM distortion. Local feedback around each FET helps to reduce distortion even more. The input op-amp also serves as a "buffer" to insure proper circuit operation regardless of the output impedance of the preceding equipment. Next, the signal is split into three different branches for further processing. One path leads to a phase shift section that is made up of six smaller stages connected in series. The amount of phase shift for a given frequency is adjustable by varying the DC voltage applied to the FET gates. It is this voltage controlled capability that makes the auto-sweep feature possible. The remaining branches are then combined with the output of this section, though in opposite polarities. (Follow the plus and minus markings on the op-amps.) This yields notches and peaks in the response that are different for the two outputs.

The low frequency oscillator provides a triangle waveform of slightly less than 1 volt when measured from peak-to-peak. The rate control varies the amount of current available to charge the 10 uF capacitor thereby controlling the frequency sweep rate. The 10 K trimpot is then used to center the waveform within a useable range for the particular FET being used. This range does vary from type-to-type and even for different brands of the same type. One important note: if you are going to be using P-channel FETs, be sure to connect the 120 K resistor on the manual sweep control to the V+ supply instead of V-. Nothing will be damaged if you don't, but then it won't work very well either. (See the parts list for some recommended FET substitutions. This may save you trouble if you can't locate the 2N5457s used in the prototype.)

Construction

There are a few routes you can take in constructing the stereo synthesizer — either using perf-board or a printed circuit. The former probably makes more sense though, as you'll only be making one. And besides, in the time spent just designing the PC layout pattern alone, you could have built the darn thing. Circuit boards are great, but only when you're making a lot of

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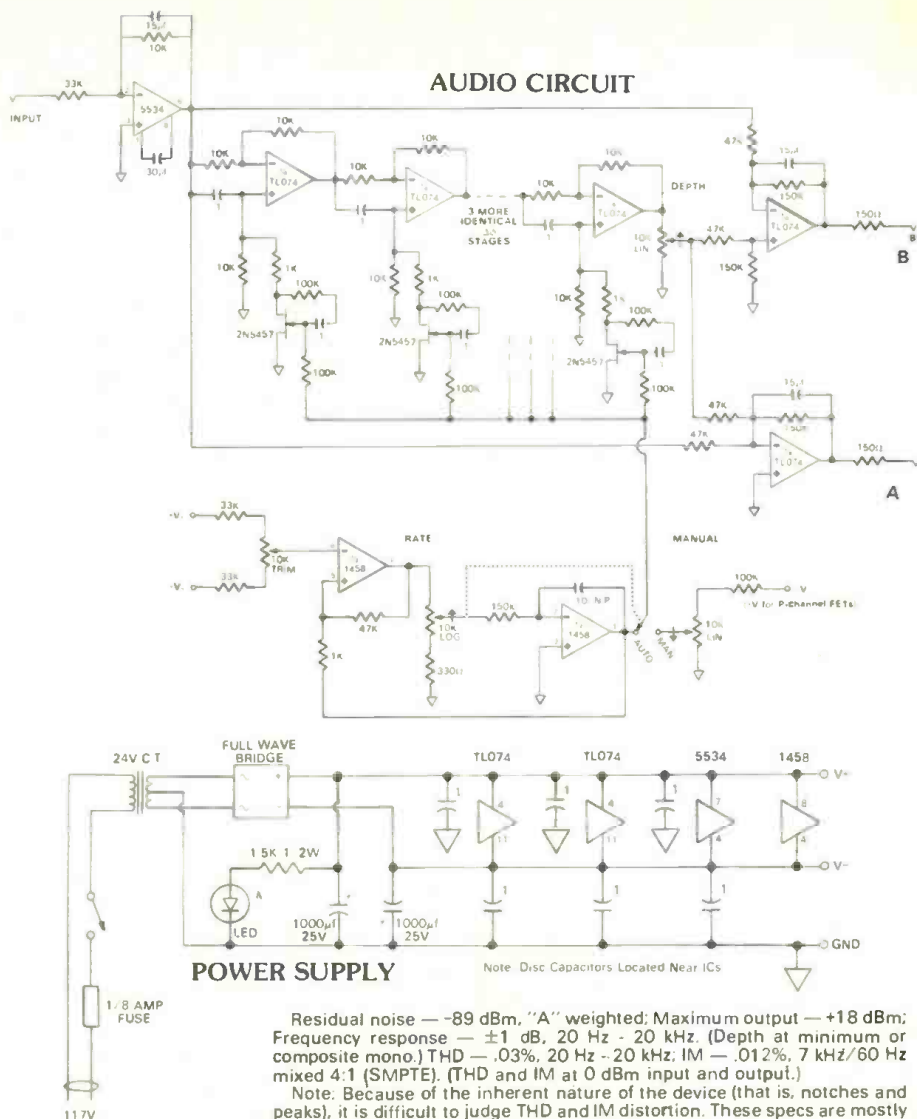


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Residual noise — -89 dBm, "A" weighted; Maximum output — +18 dBm; Frequency response — ±1 dB, 20 Hz - 20 kHz. (Depth at minimum or composite mono.) THD — .03%, 20 Hz - 20 kHz; IM — .012%, 7 kHz/60 Hz mixed 4:1 (SMPTE). (THD and IM at 0 dBm input and output.)

Note: Because of the inherent nature of the device (that is, notches and peaks), it is difficult to judge THD and IM distortion. These specs are mostly governed by the op-amps used, but at certain control settings may degrade to 1% or more. The PC boards as well as the FETs for this project are available from the author. The cost of the board is \$12.50. A set of six FETs is \$4.00. Ethan Winer, Cavray Road, Norwalk, CT 06855.

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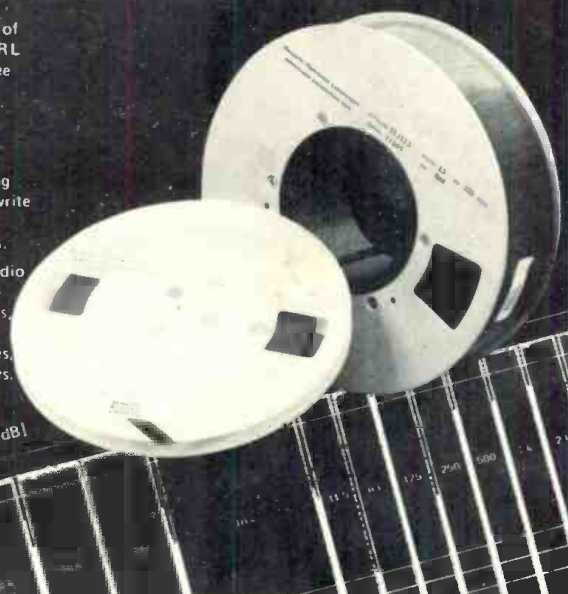
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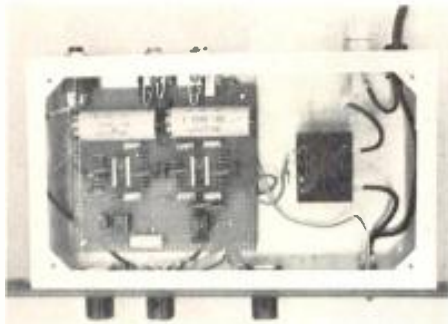
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something. Anyway, the only perf-board really usable with ICs is the kind that has holes in rows one-tenth inch apart. This will line up with the standard lead spacing for all ICs and IC sockets as well as any other components you'll be using. By the way, if you decide to use IC sockets, never use a gold plated socket if the ICs have tin plated leads or vice versa. Many people don't realize this, but over the years, corrosion can result from the dissimilar metals if even the tiniest impurities (like sweat or other moisture) gets on the mating surfaces.



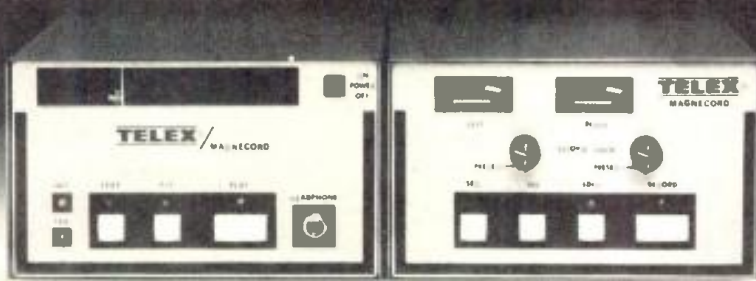
For most audio work, carbon film resistors are generally preferred rather than standard carbon composition. The film types have lower "self-generated" noise levels, suffer much less from temperature drift and usually have a tighter initial tolerance. Interestingly, the film types also cost less.

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As the effects of the stereo synthesizer can range from very subtle to the bizarre, care should be taken when approaching certain types of music. You would not, for example, process a delicate flute solo with a rapid sweep at full depth, as the constant image shift will provoke the flautist to do you bodily harm. The sweep is very pleasant, however, on certain other instruments. The electric bass takes on a new, electronic dimension and once you hear it on a Rhodes, you'll never mix down without it. When the sweep is off and the image stays fixed, the effect stops drawing attention to itself — even at full depth. Though you might think that the comb filter effects would be obvious and therefore objectionable to many people, it is not so noticeable, even when standing nearer to one speaker. The brain apparently fuses it all back together and even with earphones it doesn't sound "phased," as long as the channels are reasonably well balanced. □ □ □

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R-e/p 67



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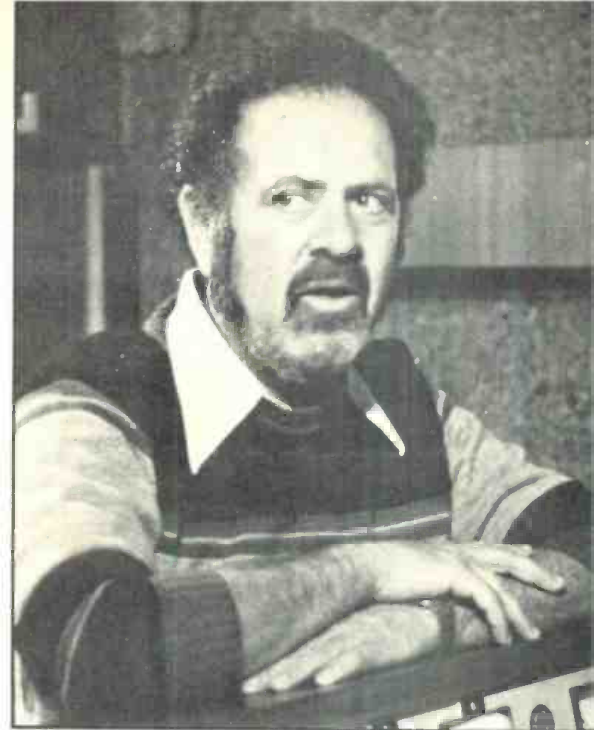
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INDEPENDENT PRODUCTION

by
DAVE PELL



THE AUTHOR

Dave Pell has been actively involved in the West Coast music business since the late 50s. He was a featured artist with many of the top bands of that time, including stints with Les Brown, Benny Goodman and Harry James. In the early 60s he produced over 400 albums while vice president of *Top's Records*. He then went on to assume the position of creative director of United Artists Records, and was there for 12 years. During that time he produced many albums, including 11 albums with Vicki Carr. Some of the hits he had with her were "It Must Be Him," and "With Pen In Hand." In 1967 MCA Records launched a new label, *UNI Records*, and Dave was chosen to head that operation. A few years later he was asked by Berry Gordy to become creative head of *Motown's* new West Coast operation, *MOWEST*. He was also an active participant during the formative period of the *Reprise* label, first started by Frank Sinatra. Dave produced the first Basie-Sinatra album as well as a number of records that utilized the talents of the entire roster of Sinatra's friends who were signed to the label.

With the re-emergence of jazz as a competitive product, Dave is playing on the records he has been producing.

Dave is also a professor teaching record production at Dick Grove Music Workshops, UCLA, and Golden West College.

There are a lot of things that go into the production of records that producers should know, but sometimes the inner workings of the finer points of the recording industry are bypassed by those obsessed by working long hours in the studio.

Let's assume that you are producing a new group for a major label and they have given you a budget of \$50,000 which is about average for new groups. Most producers get a flat fee per finished song. These fees can range anywhere from \$300 to \$2,000, so that all the time you spend in the studio won't make any additional monies for you, it's just that any excessive time in the studio is chargeable against your budget. All monies spent for production or any other facet of the creation of the album are chargeable against artist royalties. If you go over budget the record companies will make the producer pay for costs in excess of 10%. So, with this in mind, it's nice to know what your costs are going to be.

Studio Costs

Most record companies don't really care where you work as the day of company-owned studios is almost a thing of the past. On the West Coast I can only think of a few companies like Capitol, Motown, Warner Brothers, and Elektra/Asylum that have facilities. ABC had one of the best set-ups in town before their sale to MCA. However, most of their activity was by independent producers. Artists signed to that label didn't realize that the facility was good and preferred to work at outside studios without big daddy looking over their shoulder.

Some producers prefer to work at one studio from the start to finish of a project and do so if they are only working on, say, one LP at a time and know their schedules ahead of time. However, I find that it's very

hard to tie up the exact room you want for an entire LP, and I'd much rather use different rooms for my basic tracks and other production. I usually like to use a small room for the first sessions where the players can get a feel, rather than rely on earphones for everything. Since all producers should be aware of costs, a small room usually runs under \$100 per hour for 16 or even 24 track. There are some great rooms in Los Angeles that have clean sounds and run between 35 and 50 dollars per hour. A lot of time can be spent in these kinds of rooms, especially if you are going to do a lot of lead and background vocals. Of course, if you have strings, try to get a room with high ceilings so you can get some natural room sound.

Musician Costs

Most producers don't really know what the costs of musicians are, and usually rely on contractors or the A&R administrators at the record companies. Printed schedules of musicians' fees are available at the AFM, and understanding them will save you many dollars. Since most of the top studio players require double and triple scale for dates, let's talk a bit about sideman scales.

The basic session for three hours, 15 minutes of recorded music, with the leader receiving double scale, is \$127.05. A contractor is needed when you have 12 men or more. However, it's smart to get a heavyweight contractor involved when you need great players for your basic tracking session. There is a 20% fee on the basic scale for a musician that doubles, with a 15% charge for the second double and each one thereafter. A double is a musician who is called to play one instrument, perhaps a saxophone, and the arranger has clarinet and flute written in the charts. He gets basic

— continued overleaf

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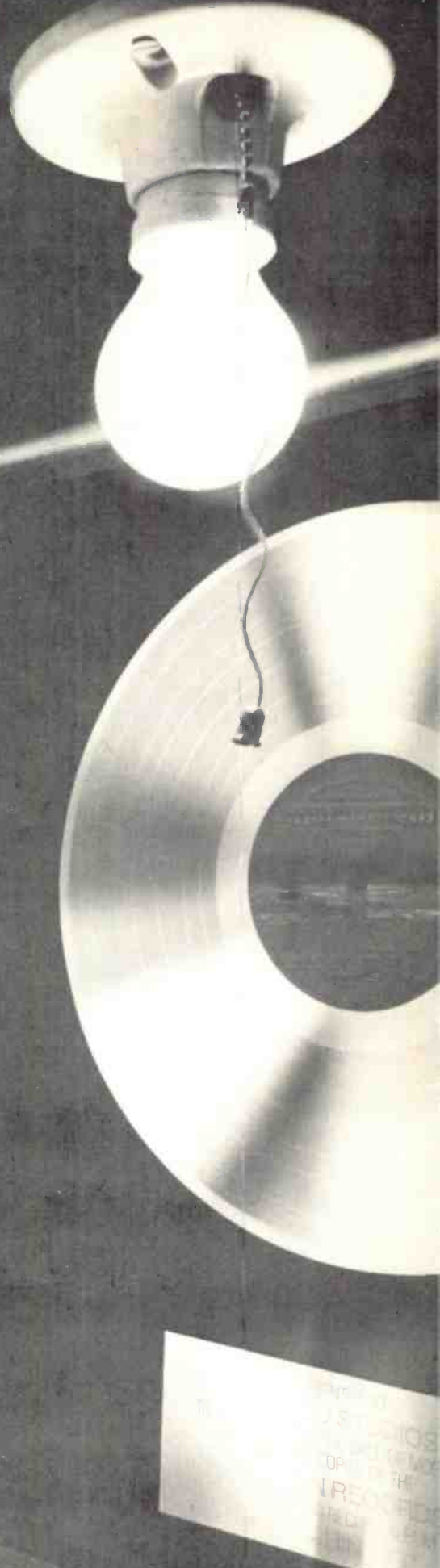
Our 161 and 163 compressor/limiters feature true RMS signal detection, which closely resembles the response of the human ear, and feed forward gain reduction, which allow for infinite compression capability. The 163 employs "Over Easy" compression, the most natural-sounding you've ever heard, and its "one knob" operation is the simplest around.

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INDEPENDENT PRODUCTION

scale of \$127.05 for sax, \$25.41 for the first double and \$19.06 for the second double and each thereafter. The AFM-EPW payments are 10% with our Local H&W Fund getting \$3.50 per each session, per man. Usually excessive costs are made because many producers like to work after midnight or on weekends and go into premium rates.

Try to plan ahead so that if you are doing sweetening sessions you can start them early in the evening or during normal working hours. You don't want to run the risk of overtime after midnight. You are allowed to sweeten four songs on sweetening dates, so make sure all the charts are ready.

For self-contained groups there is a little known rule that can save the record company a fortune. Each musician that is getting royalties from the sales of the records can be paid the basic fee of \$127.05 for each selection recorded, and they can then work on the tapes as long as they need to without any additional payments, or as long as the studio budget holds out.

The problem with working with a self-contained group is that you tend to spend many late hours trying to get something just right, and when you listen to the tapes the next day, you're amazed to find that the work will have to be done again. I find that mixing tapes or mastering should be done first thing in the morning, before you have any business dealings or problems. It's also very smart to know your limit to the amount of time you can concentrate. Small speakers for your mix will help your longevity and concentration. You can always burp yourself with the large speakers after you're sure of the mix.

Pacing

Since a single is what makes an album into a big seller, use the pacing of the album as a tool for additional exposure on radio not for just best listening sequence. There is now a whole new concept on just how to pace an LP. Years ago we would put the single as the opening tune on side one and the next potential single as the second side opener. I have noticed that producers and record companies feel that it's more important to make one side of the LP as the powerhouse, because most record buyers only want to play the hits and usually play only one side of the album. It's very important to plan ahead and try to hype the next single by making that your opener, with the existing single as the closer on side one. I feel that after opening with the next single, the second spot on that side should be your next strongest selection. Your weakest side should be next to closing — that is — the

weakest of the strong songs. Don't worry about the B side, since we usually don't have more than possibly three LPs in a two year span. Therefore, you might want to open the second side with the third potential single from the LP. The dream of all producers is to have three hit singles from one LP.

Example

Side One:

- 1 - Next Single (possibly title of LP)
- 2 - Strong Song
- 3 - Weaker Song
- 4 - Weakest Song
- 5 - Existing Single

Side Two:

- 1 - Third Potential Single
- 2 - Strong Song
- 3 - Weaker Song
- 4 - Weakest Song
- 5 - Strong Song

Don't forget for programming sake, try not to follow songs in the same tempo or feel, and never in the same key.

It's also a very good idea to name the LP after the second single that you will be pulling out of the LP. Most record companies will sticker the first single, and in case it's a dud, they don't have to change the art work.

Publishing

I know everyone tells you how important it is to own your own publishing company. I really don't disagree, however, I feel that it is more important to use publishing as a tool and a bargaining point. When negotiating the contract on your group I think it is important to try and keep maybe 50% of the publishing rights. Use it as a wedge to get more advance monies for your group. If you are doing business with a major recording company, they usually have strong publishing affiliations. Give them the administration rights for they can make a lot more money for you. Just being a sole owner of your own company has its drawbacks, and usually means that you are a collection agency for mechanical royalties only. That means you receive monies only from sales of your records. A major firm can get additional monies for you from printed materials, commercials, film use and much more. Sometimes they even have their own promo people to help make sure the record has a chance.

I produce many jazz albums and SESAC has a policy of giving writers of jazz monies in front for material recorded. Since most jazz albums don't hit the national charts and are usually bypassed by screening done by ASCAP and BMI, it's nice to get the writers the advance monies. I'm not saying that BMI or ASCAP wouldn't do the same thing if you asked for it; SESAC just makes it a policy. I like SESAC because they have to try a bit

harder. When a company charges you administration fees, 15 to 20% is normal. The larger the company you deal with, the more professional they seem to be, and I like doing business with pros.

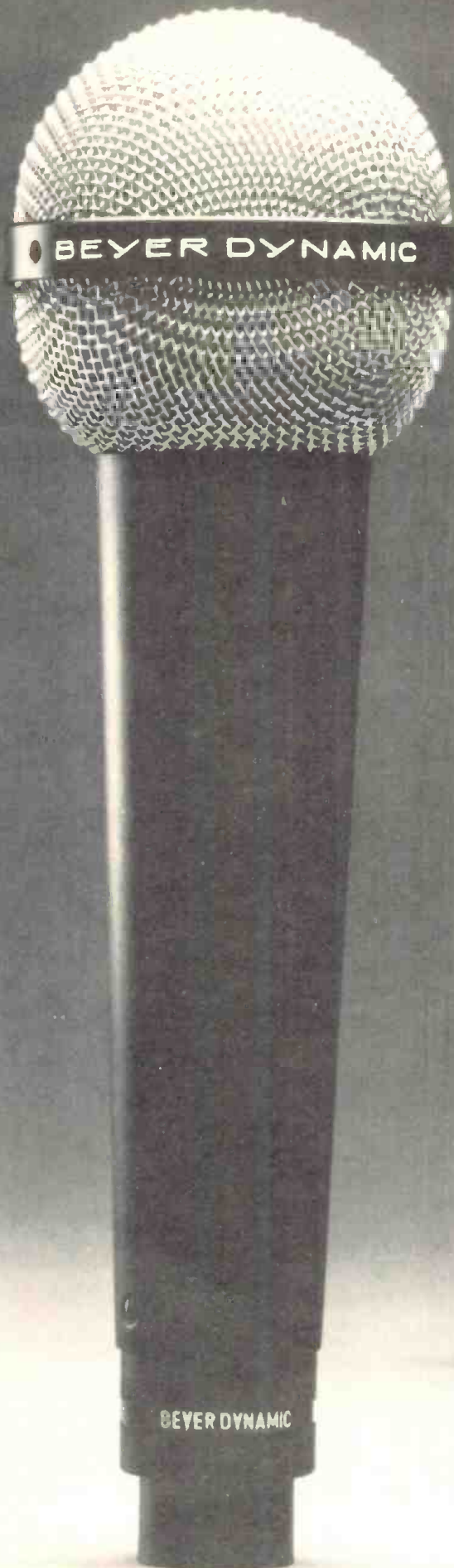
Contract Negotiations

It's nice to be knowledgeable at the negotiation table because in today's record business the most misused man is the producer. If you haven't got a track record you may be on your way out sooner than you think. Record companies would rather have a new group in the hands of a producer of their choice. Be careful that you have a good music business lawyer to make sure you will be producing your group, even though you found them and brought them to the record company.

Producers should not be included in the artists contracts and your lawyer should negotiate for your percentages and fees separately. Once you have the record company interested, then you should bow out and let the pros have at each other. Some record companies don't like to give points to producers but would rather pay a "finders fee" for you bringing the group to them. Knowing that in front, I usually make an agreement with the artist that in the event the record company decides to use another producer, or the artist wants to produce themselves, I get royalties from the artist royalties. That way the artist will think twice about producing themselves, and will always be in there fighting for you, so that the points don't come out of his royalties. The better record companies will protect you and give you something in the event they use another producer.

Usually artist royalties and advances escalate year-to-year as each option is picked up; producer's royalties do not. You can, however, ask for a larger fee per song in the event the options are picked up. If you get a smash hit for your artist, the record companies are usually happy to talk to your lawyers, especially if your artist is in the black.

If you are secure in your own knowledge and the working habits of your artist, try to get a set fee recording budget from the record company for the whole project. In this manner you can work at your own pace, possibly use studios of your choice where you can make deals, and pocket the difference between costs and the budget. However, be very careful as this can also backfire when you can't finish the project for the monies advanced and you have to pay recording costs out of your own pocket. Record companies like this system because they know what their costs are going to be, with no surprises. Regardless, you still have to give them just as good an album without cutting corners like using a smaller string section, or less brass, etc. Good record companies will give the producer a half-way



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decent budget, and will let him go over budget by 10%, after that they get rough, and will even cancel any further work until they have evaluated your tapes to that point.

Producer costs should not be considered chargeable against artists recording costs. Most companies feel that this is valid, but old line companies disagree. Also, make sure your legal advisor tries to keep the words "cross-collateral" out of the deal. Your projects should stand on their own, the label should not be able to recoup costs paid under this contract or "any other" contract, i.e.: publishing, other artists, and many other devious methods.

There is one other dirty word, but no one has figured a way around it. The statement — "reasonable reserves." The record company has the right to wait until all the returns are in before paying you. It's a cold day when you get your money — not the advances or fees — but royalties. Some friends of mine have just started a service for producers similar to hiring a CPA to go in and check the books on royalties owed from the various record companies. Record companies are marvelous that way, they make you wait on your monies. They are also your bank, your tour support, your father confessors. By the time you sign your agreement as a producer, and sign your group, you usually hate the record company.

Fresh Ears

One of the things I learned at Motown was to use fresh ears. A producer finished his product to the best of his knowledge and tastes, but had no further control over his production. At Motown they felt that fresh ears were more important than the feelings of their producers. They had engineers that only did mixdowns on other producers and engineers product. Their fresh approach to a tape that someone had been working on for months was normal procedure. Sometimes they would get incredible results. However, I disagreed with that kind of handling of a producer's product. At United Artists we would do much the same time with tapes that would come in from leases, or tapes purchased from producers in the field. The boss would ask me to go into the studio to see if anything could be done to the tapes to improve the existing master tape. A number of times a hit would be big in the country field and now we would want to try to make it cross over to the pop market, so I would be sent to the studio to take out the steel guitar or something like that. It's kind of unfair, and when you get to be a big producer or have a good lawyer, perhaps he'll put a clause in the contract that says

"hands off" . . . no one is to touch your finished, approved master tape!

Wouldn't it be marvelous just to be creative, without all the business dealings, and without the unknowledgeable people you have to do business with.

Casting

This is one of the most important words in a producer's vocabulary.

- 1 - The right record company for your artist.
- 2 - The right music business lawyer to negotiate.
- 3 - The right song.
- 4 - The right arranger.
- 5 - The right musicians and background singers.
- 6 - The right studios.
- 7 - The right remix engineer.
- 8 - And most important . . . the mastering engineer.

1 - The Right Record Company For Your Artist

If a singer sounds like Streisand, Columbia Records would be a poor choice to try to make a deal. I produced Vikki Carr when she was with United Artists. When she left to go with Columbia I felt it was going to be an uphill battle since both Streisand and Vikki were in the same bag. Vikki never had a hit at Columbia. I always felt they gave her a different treatment than would a record company that had no similar MOR artist. A much better idea is for an artist to try to make new deals with the record company for whom they have performed. If they leave the label every time a new album is released, the old company will release some junk from the can, and the artist's value becomes watered down — especially when every six months there is another "Best of" being released. Sometimes they even find out release dates of new products so that the old product can ride the waves caused by the new LPs.

2 - The Right Music Business Lawyer To Negotiate

(After you have the record company interested.)

I don't mind taking a new artist to a record company, but as soon as they say they are interested, I bow out of the negotiations. Even though I consider myself knowledgeable, I believe it is easier on all concerned if I'm not there when lawyers talk to other lawyers, or when businessmen are discussing the act. Sure there are important points that have to be discussed, but I feel that creative people should stay out of those meetings. If you have a groove going between the artist and the A&R department, leave it that way.

Creative people are in another world that business and lawyers don't really understand. Keep them out of the studio and you

stay out of their way. Make sure, however, that your lawyer is in the music business and not from some other field. A bad lawyer can hang up a deal for months. They all cost about the same, and music specialists are worth every cent they ask. Sometimes if you haven't got the bread, they might take a piece of the act instead of a normal fee. It's nice to have a heavyweight in your corner.

3 - The Right Song

Evaluating material is a very special talent. Being knowledgeable about what is commercial and what makes a good song is something that takes a lot of time, patience, taste, background, and cleverness. It is very important to be conversant with all the top records, and the songs involved. A producer has to know what is selling for him to be able to advise his artist as to what he thinks will sell for them. He should be able to dissect their songs if they are self-contained, or be able to go to publishers, and evaluate the songs presented to him.

If a producer can explain exactly what kind of a song he is looking for, a good publisher can be a valuable resource and find the material in question. Sometimes a knowledge of hit records from the past several years can also be a source of material. An example of this is Peter Asher's selection of material for Linda Ronstadt. Songs that were hits make great records with new artists. Finally, once a producer has a hit everybody in the business becomes his friend and wants him to do their songs.

Play it straight with the publisher. Don't hang onto a song just because you think it might be on the next session. The more songs you hold for your artist, and the more times you have to tell the publisher that their song didn't make the session, the colder you'll get. I'd rather be truthful about doing a song than hang up writers, publishers and their professional representatives. Return songs that are on the fence; don't give promises that you can't keep; and above all be truthful.

4 - The Right Arranger

There are so many great arrangers in our business that this choice is mainly through association with other musicians, arrangers and the like. I always use arrangers that listen to what I have in mind and don't shock me when I get to the session. If I know I'm going to use a lot of strings, I'll lean toward an arranger who knows how to handle strings. I always use the same arranger to do my tracks, sweetening sessions and backgrounds. Many of the more successful producers use different guys for each aspect of the recording sessions. I tend to have the feeling that everything becomes disjointed by having to many cooks preparing the final product. An arranger working with a self-contained group can be of great assistance in making something good into a hit.

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R-e/p 75

INDEPENDENT PRODUCTION

5 - The Right Musicians and Background Singers

Knowing the players in town is very important. In the event you are from out of town, or you just need some direction in this field, there are very knowledgeable contractors that can help you cast the players correctly. Learn to work with these pros and you'll save yourself heartache by having the wrong guy on the date. The record buying public doesn't really have to know who the sidemen are; all that counts is that you make a hit record. I made eleven albums with an artist who was featured as soloist although he never appeared at the sessions. However, we had hit-after-hit with him. I used to finish the sessions and send him the charts with a tape from the sessions and he would learn the parts. Finally, he insisted on playing on one album which he did, and the record company dropped him. It was far inferior to the product we had been putting out with studio musicians.

Background singers can really help you make things happen. Some arrangers won't even write a sketch as to what they want on an arrangement. They just call some singers who don't read, but who really know where it's at. They'll play around with different ideas during the sessions and it usually

comes out fantastic. Of course, it's nice if they can read; but the important thing is what they can add to a tape.

6 - The Right Studios

A lot of producers are impressed that certain studios have had various hits made there so want to work under the same conditions. I really feel that they're putting themselves on. That's the hype that all studio owners try to make so important in their press releases. With 162 studios in Los Angeles, I feel that a good producer should be able to make sounds at most of these wonderful places. Remember, the important things are that the place gets a clean sound, and they make you feel comfortable. It's your own ears or who you have hired that will really make the difference. With most rooms now being state-of-the-art establishments, you should be able to make hits anywhere.

7 - The Right Remix Engineer

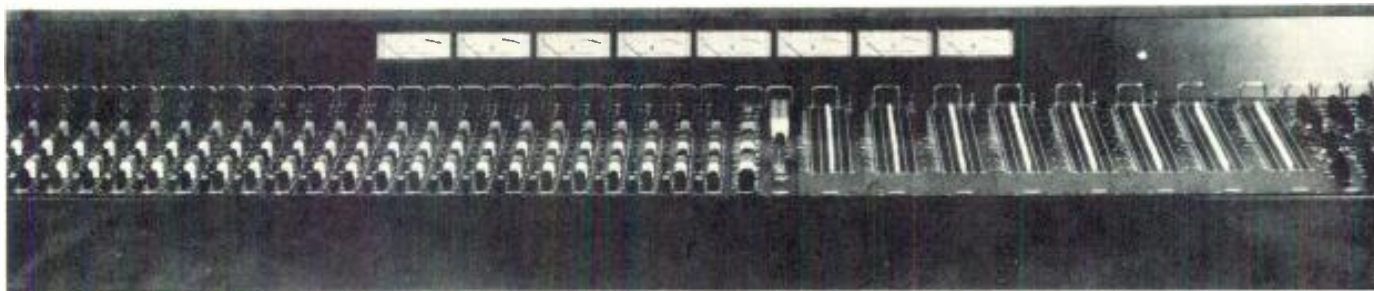
Here is where you need a pro to see if the marvelous things we have done can be made to sound sensational and still be transferred to the lacquer for our final master. At this point (if your budget can afford it) go to the *best* place in town and hire the ears of the best engineer you know. Someone who knows the particular room you're working in. Get the engineer, studio

combination that is right.

All along I have felt that you don't need outboard equipment. Everything seems to add noise. In case you do find noise, now is the time to have everything at your come up with something resembling the final mix. Never, never bother the engineer 'til he asks you what you think. It's very important not to bug him, especially if his ears are fresh to the project. He might hear something that you never thought about. Use his knowledge. Keep your hands off the board until he's ready for you, then you can say your piece. I know that this is very hard for most of us. Most producers today are so good at their trade that they don't even want an engineer to help them. They have the house engineer set up the board and let him sit back in the corner 'til they need him. Well, everybody is different. I prefer to let the ears I have hired help me create what's technically right. It's very important to not experiment at this time, after all that's why we used the cassettes. We are most likely paying top dollar now, because we want it to be right. So, let the pro you hired do his thing!

8 - And Most Important — The Mastering Engineer — Making The Final Lacquers

If you have done your job well to this point, you shouldn't have much trouble



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Above: 28-in, 8-out matrix with eight 1/3 octave graphics and eight 18db/octave tuneable crossovers, for CONCERT SOUND of St. Louis.

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getting the sound you want from your final mix to the lacquer. Some record companies insist that you work at certain rooms, and if I know the people involved, I don't mind, but normally I use Lanky Linstrot to cut everything I do. Lanky worked at the ABC studios for years. He can EQ tapes that I thought sounded great and make them sound better. His use of overall echo, limiting, and equalizing each track to match are uncanny. We discussed all the problems, such as who will be making the metal parts, and what pressing plant will be used. When you get a guy in your corner it's amazing how another good sounding tape becomes a masterpiece. Lanky always makes an EQ master copy of our original tape in the event the record company needs tape copies for overseas affiliates, cassettes, 8-tracks or even additional plants that need lacquers cut. By having this EQd tape, all his mastering EQs are now on a tape that can be copied flat.

I always have an acetate cut that I never play until my first test pressings are sent to me. In that manner I can see if processing, and the pressing plants, have done their jobs well. If you play the soft acetate more than one time, the top end disappears, and its use as a checkpoint is diminished. If you have any problems the place to check things out is in the mastering room. They can use their scopes to tell you what your ears can't hear.

How To Get Along With Artists; Musicians

There are certain things in our business called respect. It's hard to come by 'cause you really have to pay your dues, and those that work for you have to always test you, to a point.

I remember doing some dates in Nashville, where the atmosphere for recording is just great. Here comes a producer from the West Coast to do some dates with a new unknown artist. Most of the players we contracted were not really acquainted with the music scene in L.A., and they didn't realize that I was a musician. I was a stranger in their midst and they came to the session not knowing what to expect. You really can't come to a session and hand everyone a bio of what hits you have made or how many albums I had recorded with my own band. I was just another foreigner using the great Nashville players and studios to make a hit. The guys played well, but nothing too interesting was happening. They wanted direction but didn't know what to expect. A few takes later we discussed the playback, and then I mentioned that I was a player myself. We started rapping about different sidemen on the coast, and about the bands out there. When they finally realized that I wasn't just a promo man let loose in the studio, their attitude completely

changed and the sessions came off sensationally. They never looked at the clock; wouldn't let a take go by unless it was perfect; and became more helpful than I could believe. I won them over by my professionalism and they couldn't do enough for me from then on.

You have to do the same thing with an artist. The singers have to gain the same respect for you. They want direction, and the more you can make suggestions that make them sound better, the more you look after their needs, the better they respond.

When you hear notes out of tune, phrases that would sound better done another way, the more they start depending on you. If you let a few things get by that they hear and you don't, they start losing confidence in your decisions. You have to burp your artists all the time. Make them feel good and know their work habits. If the gal isn't singing just right and sounds depressed speed up the tape a bit. The change of tempo will make things seem brighter, and sometimes helps. Don't get locked into a tape speed just because that's where you recorded it. Try experimenting.

Album Covers

Why should a producer understand the problems of the art department and the concept of cover art?

A producer that is sharp about the

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KEY SPECS: Delay Mode: 80dB dynamic range, 0.1% T (N+D), 7kHz, 256ms delay, 16 programs of delay times for 8 Audition Taps; Reverb Mode: decay time 0 to 3.5s, EQ +0/-10dB at 20 Hz and 7kHz, two programs of reverb taps; Echo Mode: delay time 1 to 255ms, decay time 0 to 13s. Mono In/Stereo Out. LED Peak Level indicator at 0, -6, -15 and -30dB. Manufactured in USA. URSA MAJOR, SPACE STATION and Multi-Tap Digital Delay are trademarks of Ursa Major, Inc.

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fingertips. If you've done your homework and have used the cassette machine as the important tool it is, you should be pretty well prepared for mixing. I use my cassette machine as a means to make sure I know exactly what I want. For each session I make copies of the various ingredients I have added and know just what I want for the final mix. I try never to say anything to the engineer until he has played the tapes and industry has to think beyond the studio and the recordings. In creating the album, he should think about concept, sound-wise and the creating of a finished package. We talked about possibly naming the second

single as the title of the album. Maybe that title could give the photographer and artist designing the cover a hook to hang their creative hat on. After awhile you realize how important a concept or title helps the cover art work. It would behoove many producers to understand scheduling of an LP and the time it takes for the art department to have camera-ready art to go to the printers. Just because the album is completed in the studio doesn't mean that it will be in the racks next week. Printing and fabrication of the cover takes quite a bit of time, on the average about 45 to 60 days.

It's also very important for the producer

to understand that in some artist contracts they have different charges against artist royalties for packaging costs. and if the producer wants a special dye-cut package with a double fold, etc., these costs for the production of covers may vary on an artist contract as much as 10% to 12% of retail. Record companies know the value of the cover, but also know the expenses involved, so now they charge artist royalties on packaging. A producer should be the captain of the ship, and should be involved with the creation of the whole package.

How To Handle Engineers

There are two schools of thought on the behavior of the producer in the studio. The new producer has a tremendous knowledge of the workings of the machinery and equipment in studios today. Usually someone with this kind of knowledge will immediately show the engineers his total command of the equipment and immediately starts touching the board. During mixdowns, he prefers to do the mix himself — sometimes costing the artist thousands of dollars in additional studio time. Since I work a lot of different rooms with all kinds of boards, I try to respect the man with whom I'm working. He should be knowledgeable of the equipment and the room, and I try to respect him by letting him set up mikes any way he wants. Since most engineers are now drum freaks, I try to let them do it the way they feel is best. Unless something is terribly distorted or wrong, you can do a lot of tricks later on in remix. What I'm interested in is clean tracks and trust my ears to tell me if it's wrong.

I have two matched cassette machines at home so that I can make all the copies I need for the artist, arrangers, and even the record companies. As long as I use a good quality tape to begin with, my copies are as good as the studio can give me since the cassette from the studio is first generation. The quality is sensational. And it's a lot more economical than if the studio made the cassettes.

Pre-Production

There are many things that come up under this heading that most producers would rather leave to personnel at the record companies.

Since liner notes seem to be a thing of the past, it's important to give credits concisely so as to give the merchandising people more space for selling or creative art work. Keep credits down to the essentials. Give the studios and engineers the credits they deserve, and the musicians, arrangers, etc. It's very difficult in this day and age to be correct about the publishers, writers, performing societies, etc., since most of the conglomerates have scooped up the old line publishers you have to be very careful of publisher credits. I always check things out

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twice, from two different aspects. Lead sheets can help, but they are not the final step. Call the publisher to determine if additional names are needed. A few phone calls often help to clarify the smallest item, but it also helps the record company when they know they don't have to reprint liner notes because of some silly mistakes.

Radio stations usually don't trust the record timings. If you're putting out a single, it's a good idea to put "intro" timings on the label copy, along with total times. If you are really sharp and want to service the DJs or program director, put a timing on the record that shows when the fade starts so he can either talk over music or cross fade.

I produce a lot of low price LPs and sometimes I have to make sure I have a rate on a song before I go in to cut it. If the publisher understands the LP is selling for \$2.98 he usually will give you a lower mechanical rate based on the length of the selection and the list price of the LP. It's much easier to do this before a note is recorded, than find out too late that a particular publisher has no empathy for your problems and wants statutory rates no matter what the price is of the LP. We used to use a lot of public domain material to offset the important tunes we needed. One more point, make sure of your spelling. It's embarrassing not to proof read the label copy.

Post Production

Not many producers today have ever been to a record manufacturing plant and, as such, don't understand their problems. The facilities today are marvelous compared to the plants that were around twenty years ago. Automation has changed the whole pressing business, and the manual pressing set ups are now almost relegated to singles only. Many producers don't know the difference between the two methods of pressing records.

A good singles plant, making records for DJ and radio play will normally make these manually, rather than by injection. The injection machines are so large and are so powerful, that for some reason they mash the hell out of a record groove. This will also brighten the top end and make your single record grooves a bit shallow, hence the possibility that tracking becomes a problem. The best plants today will use their manual machines for DJ and short runs only. The stampers wear better and are less likely to deteriorate. Some of the small plants do LPs manually, but they are slowly disappearing. You really have to know the pressing business to make good LPs by hand. Several small plants that specialize in direct-to-disk pressing still have some good operators that know this fading art.

The plating departments in pressing plants today are really refined and use high

speed tanks and all kinds of new gear. However, the direct-to-disk people still prefer the slow, old fashioned way of making their metal. Direct-to-disk has updated many of the metal matrix setups, and millions have been spent in this area. It's nice to know just who is pressing your product. However, be aware that all majors use secondary plants to help when they get overloaded. This sometimes is better since the small plants have better quality control and try harder to keep the accounts.

I love to have producers that watch the store and know when there are different matrix numbers from each plant, and can tell the difference between pressings. Most plant managers welcome professional people to see their plants, and it makes sense to know their problems and see their pride and joy.

I just recently finished a new LP for GNP/Crescendo Records with my group called *Dave Pell's Prez Conference*. The album features Joe Williams singing some marvelous versions of the songs that Lester Young played solos on through the years with the Basie band. These tunes were originally sung by Billie Holiday, Jimmy Rushing, Ella Fitzgerald and Helen Humes. The concept of the album was to re-create Lester's solos, note-for-note, and then let Joe Williams do his thing vocally. We used four saxes, rhythm, and Joe. The interesting

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- **Height:** 58"
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R-e/p 79

thing about the project was the way we recorded it.

Gene Norman was kind of upset with me because I asked to use a new state-of-the-art studio called Jennifudy, owned by a long-time friend, Phil Kaye. I explained to Phil what we were going to do and asked him if we could go directly to a 30 ips ¼-inch master tape, with no outboard equipment, and bypassing the hours of mixing 24 tracks. Joe sang in the same room with the band, so everything was live. What Phil was hearing in the control room was our master mix. It puts a great deal of pressure on the men in

the band, but it seems to be the pressure jazz performers thrive on.

When you record jazz you go for the best feeling performance, and don't worry about a mistake here and there. Squeeks, stands, chairs moving, aren't important . . . even wrong notes are okay as long as the feel is correct. We did four tunes per session, with the last session being used to re-make some of the previous day's performances. Each time we ran the ¼-inch they also ran a cassette. I'd make a cassette copy of the best takes for Joe, and we'd know exactly how we stood for the next day's sessions.

The album took three sessions, nine hours of recording, and then the next day Phil Kaye and I sequenced the tapes, and edited a couple of wrong notes and endings from previous takes. We used about four hours of editing and sequencing time. Total time in the studio was 13 hours, and I couldn't be more pleased with the results. We paid top dollar for the studio, and a lot of boxes of tape at 30 ips. But the sound is absolutely clean, and I believe that the master we will make from these tapes will be as good or better than if I went direct-to-disk the quarter-inch tape can now be mastered with

THE DIRECT-TO-TWO-TRACK SESSIONS AT JENNIFUDY

by PHIL KAYE

When Dave Pell called me and told me how he wanted to record this album direct to two-track stereo tape, my first thoughts were of the technical advantages. This process would eliminate all the inherent problems of recording onto the 24-track tape, utilizing noise reduction and remixing to the final two-track stereo master tape.

This would be a rare opportunity to deliver a two-track stereo master tape to the lacquer master cutting chain, that reproduced what we heard and mixed on the original recording sessions.

The evening of the first session gave birth to a tension that you could pleasantly feel throughout the studio. For myself, it brought back memories of past recording sessions before the introduction of 8, 16 and 24-track recording.

Musicians, producer, engineer and invited guests, we all experienced it. We all knew there would be no "punching in" of mistakes, no "fixing it in the mix." What we did together as a team would be the original product.

My approach was to take the sound of the instruments as heard in the studio and get it on tape as faithfully as possible. Therefore, I tried to pick mikes that would 'do the job' without a great deal, if any, of EQ.

The only outboard equipment used was an 1176LN limiter on the vocal to catch the peaks. A 32 x 32 Harrison console, a 3M-79 two-track, at 30 ips, made up the control room equipment.

The microphones I used and the reason for their selection, as well as their placement, are as follows:

1 - A direct box for the acoustic bass amp used primarily to reproduce the low frequencies and to sweeten.

2 - Neumann KM-84, acoustic bass. After trial and error chosen to reproduce primary signal of bass.

3 - EV-666, kick drum. An old favorite for any type of bass drum.

4 and 5 - AKG-414, a pair were used for drum overheads. They have a clean crisp top end and are small enough to stay out of the drummer's way. Used primarily to pick up cymbals and the overall sound of the kit.

6 and 7 - Neumann U-87, floor and mounted tom. Has good bottom end and crisp mid-range to reproduce attack of drums.

8 - Shure 547, snare. Good front-to-back ratio, easy to get into tight places, good overall response.

9 - AKG C-414, hi-hat, placed about 6" above the top cymbal.

10 - Neumann KM-84, acoustic guitar.

One of my favorites for guitar. Its compact size and frequency response make it ideal for this instrument and close miking.

11 - Neumann U-47 FET, piano. Good, clean low end. Placed over hammers and used to sweeten mike #14.

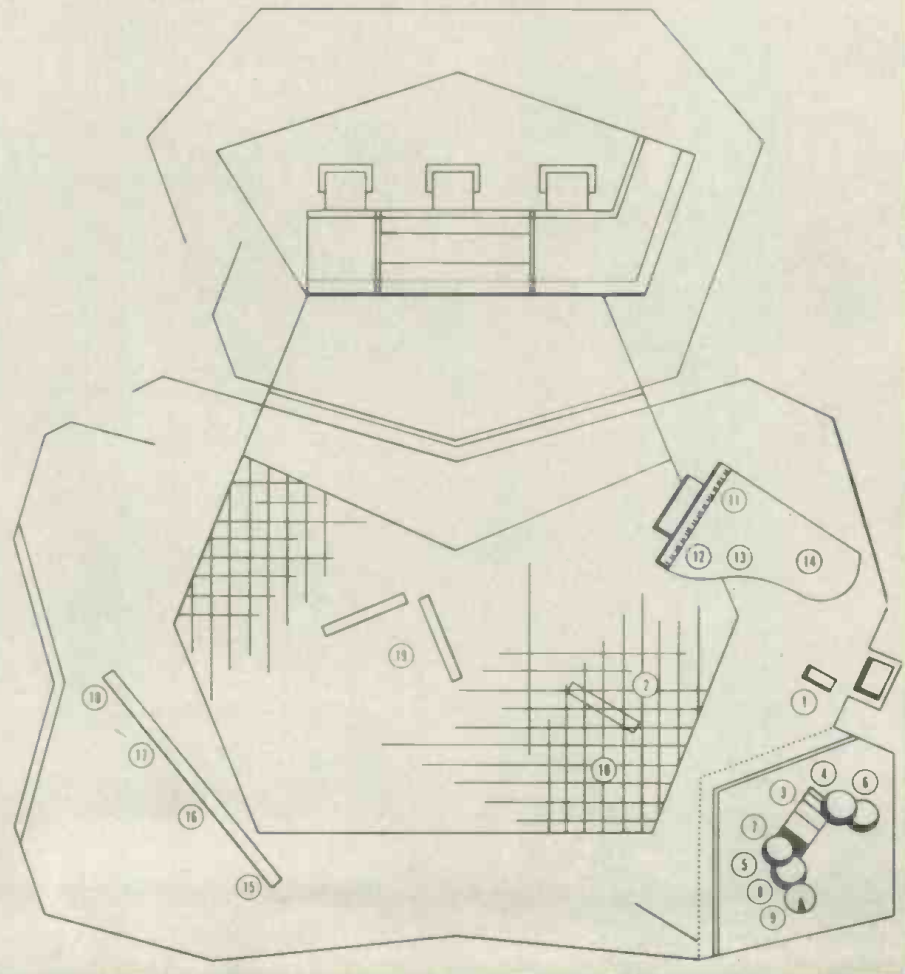
12 - Neumann U-87, piano hammers. Clean mids. Was used to sweeten mike #13.

13 - Neumann U-87, piano. Placed over frame and used as the primary source for top end.

14 - Neumann U-47 FET, piano. Placed over frame as primary source for bottom end.

15, 16, 17 and 18 - EV RE-20, one baritone and three tenor saxes. Marvelous for woodwinds. They give a very honest reproduction of the saxophone as it sounds in the studio.

19 - Neumann U-87, vocal. A personal favorite on voice.



Phil Kaye, Dave Pell, Gene Norman



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boards six years ago and it still runs a tightly packed schedule of original vocal session recording and mix-downs", says Ken Justiss, Operations Manager of TM Productions in Dallas. "Since we do more commercials and station ID's than anybody else in the world, we produce literally thousands each year, and at some point they've all gone through this Son-Of-36-Grand (serial number 011)."

"There's not a faster board to work with than the Auditronics 501 whether we use it for building demos or complex production tasks. It's compact: all its controls are so very accessible even trainees become proficient on it quickly."

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HOW TO PRODUCE YOUR OWN MASTERS

Financing

It's a lot different producing your own masters to sell or lease to a record company. First of all you'll be spending your own money or funds you've raised from other source(s).

The easiest way is to use the publishing aspect of your production company to interest a major publishing company in possibly a 50% split on publishing. It's always better to do business with a major company that is owned by a record label. If you have cast your group correctly, you already have an idea of a record company that might be interested in your group. Go to the publishing company and their professional people and play some of the songs for them. Most of the good companies might give you studio time for first right of refusal on the songs. The free studio time should be

enough to make super demos for the record division to become interested.

In Los Angeles, we have a financial institution called the Los Angeles Bank which is involved with many major record companies and also with some of the performance societies. They are knowledgeable about different ways you can borrow from them without putting all your properties in hock. They can advise you in ways that you can't imagine, such as advances from BMI or ASCAP, etc. They do not become your partner in any way, they just happen to be involved in our industry, and if you have something interesting, they are there to help.

Contracts

I'd make sure that you have some kind of agreement with your group before spending any of your own monies. Most of the music business attorneys can give you a contract to hold your group, until you finally make a deal. If you are really pressed for money, a short letter of agreement with the important points of your deal will also suffice. I'd much rather put my deals in layman language, however, there are plenty of stock contracts that you can improvise from, at least until you can afford some legal advice. Spell out things like what happens when you start negotiating. The record company usually



... still an active player, with session men Bob Efford, Bob Cooper and Bob Hardaway

wants to know that you have some sort of deal with your group, and for how many years. Make sure that the contract you sign with the group has a clause that permits you to assign their contract at new royalty rates, just in case your deal with the label is heavier than the bare minimum. If I find that I have a self-contained group, I'll sometimes go to a studio and trade points with them for free studio time. I find it very helpful in my dealings with a studio to agree to pay them double their normal rates when the group has been signed to their contracts, and we have been paid advance monies.

Be very careful, however, in making the deal with the studio, that you don't lock yourself into completing future work there. Many groups that become successful usually want to move up in class as they get larger budgets. The days of people being loyal to those who have given them a start is a thing of the past. Once they become successful they are always looking for the most expensive state-of-the-art facilities, and those studios usually won't make deals. Protect yourself with the basic facts of life that most groups will want to try something new, and you shouldn't try to push the first studio too hard.

Recording License

How important is it to have your own license? I find that its very convenient for my use. The American Federation of Musicians is only too happy to give you a license, simply make the application through the Federation in New York. I believe the charge is \$100, and they want to know some history on you, plus the fact that you can pay your bills. It's also handy if you have your own publishing company and need to make "legitimate" demos.

How To Get To The Record Companies

Record companies have a marvelous way of making it difficult to get in the front door. I



NOISE GATE GT-4

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find that a phone call to the A&R department will at least give you an idea as to whom should receive the tapes. *Billboard* magazine has a source book that lists all the record companies and their A&R personnel. If you don't know someone at the company, try to ask the secretaries what their procedures are and the name of the person you can send a tape to. It's much like publishing companies who refuse to accept tapes or songs mailed to them that are not addressed to someone at the company. There have been too many lawsuits by people claiming to be ripped-off. The result has been record companies and their publishing affiliates play it safe by returning the material unopened.

The good record companies will want you to leave a cassette and/or a 7½ ips reel-to-reel tape. A lot of execs these days will use their car cassette player to hear new product and groups. The street person will normally preview your tape and then they'll give the execs the tape to verify what they have heard and liked. Most companies would rather go through this kind of song-and-dance before someone with any authority listens to a tape. Of course, if you know someone at the company, have them set up an appointment for you.

The most important thing is that when you do have a live audience with A&R people, don't blow it. No excuses, cop-outs, or dialogue; "let the tape speak for itself." Make sure that if you are playing it for someone of importance, have good copies. A tape that has a lot of hiss and is a third or fourth generation copy won't make it. Have pictures and bios of the act. The more professional you make the presentation, the better. If you have to explain that the demo is just a demo, make it plain. A good company will ask to see the group perform in person, and then might advance some free studio time to make the demos into masters. If the songs are published by your own firm, spend the money to have professional lead sheets made. There is nothing so amateurish as to see songs written on beat-up papers, in pencil, with coffee and pizza on them.

Don't get involved with personal managers, agents or parents if you can help it. Once a record deal has been consummated that's when these other professionals can help you. A good manager won't touch a group until they have a recording deal with all kinds of promotion money, tour support, merchandising deals and the like.

Remember, the name of the game is *promotion and merchandising*. I know producers hate to admit it, but it's really true. Unless a record company can give you support, it won't really matter what you have done in the studio.

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Noise & Distortion

(Now you Hear It! . . . Now You Don't!)

by
Paul C. Buff
Allison Research

There have been many works written on the various forms of distortion associated with audio electronics and transducers. Unfortunately, while most I have read have presented valuable information on the subject, the reader is usually left without any real basis for relating the number or percentages to the audible results.

The purpose of this article is somewhat different. What I shall attempt to do is to remove some of the mystique, and to develop a format for applying cause and effect logic to the various distortion types. I believe that with this format, the reader may be able to make confident and valid assessments of the audible coloration which might result from a given set of distortion and noise figures. I think, further, that a set of specifications and graphs will allow the reader to formulate intelligent criteria for specifying the degree of "transparency" he (she) desires, or is willing to pay for.

I must, however, state that some of the views presented herein are, to a large degree, my own hypothesis, and are based on my own observations and common sense logic. I would, then, invite constructive criticism, as well as further exploration of the subject matter presented, by those who have a greater knowledge than I.

What Is Distortion?

If we apply an input signal to a device under analysis, we are certain to get an output signal which has some portion of the input signal diminished or deleted, some portion emphasized, and some new signals which were not present at the input.

Any non-intended differences between the input and output signals should be classified as distortion, as these differences represent imperfections in the transfer function, and may be audible. *May be . . .* that's the catch. There is no perfect transfer medium, and that includes the proverbial "straight wire." The trick is knowing how much "perfection" is required to satisfy the ear.

Some common distortion forms are:

Amplitude vs. frequency (frequency response), Phase vs. frequency (Phase response), harmonic distortion, intermodulation distortion and noise.

Some of the less common distortion forms are transient intermodulation distortion (TIM), slew induced distortion, oscillation and damped oscillation (ringing), amplitude dependent frequency response, amplitude dependent gain (signal expansion/compression), crossover or "notch" distortion, RF susceptibility, power supply noise susceptibility, microphonics, control signal feed-through (on voltage controlled or digitally controlled devices), and any other anomalies which might result from a specific device design.

In electro-mechanical storage devices, for instance, we find flutter, wow and rumble. In digital audio there is quantizing noise, aliasing, clock noise, etc.

The list goes on, and will continue as long

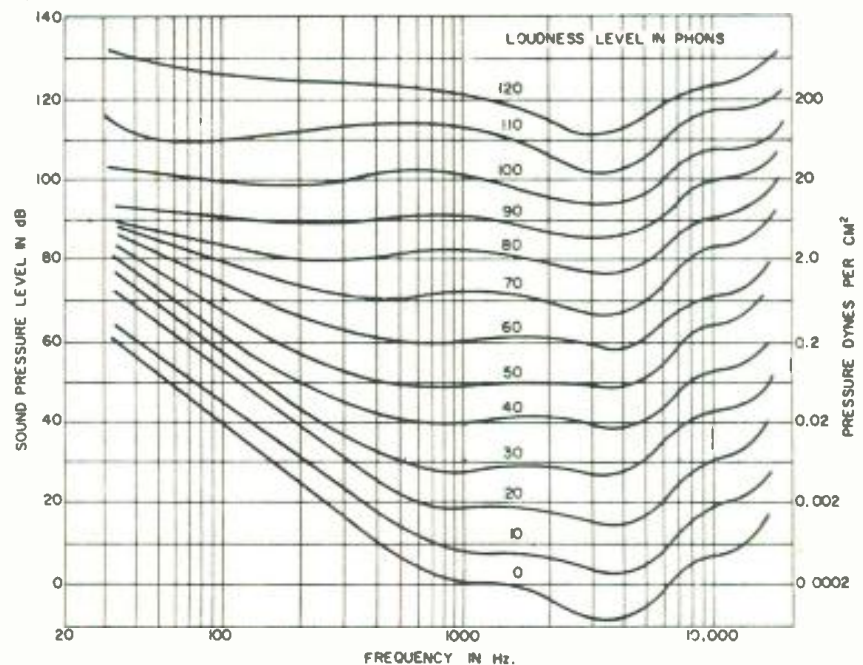
as new devices and processes are developed. The purpose of this article is not so much to identify all possible forms of distortion, as it is to present a general format for weighing the audible consequences of any distortion form.

Generically, most distortion forms may be placed in one of two categories . . . those forms which alter the components already existing in the input signal (i.e., frequency and phase response, etc.), and those which add new components, or products, not originally contained in the input signal (such as harmonics, IM products, noise, etc.)

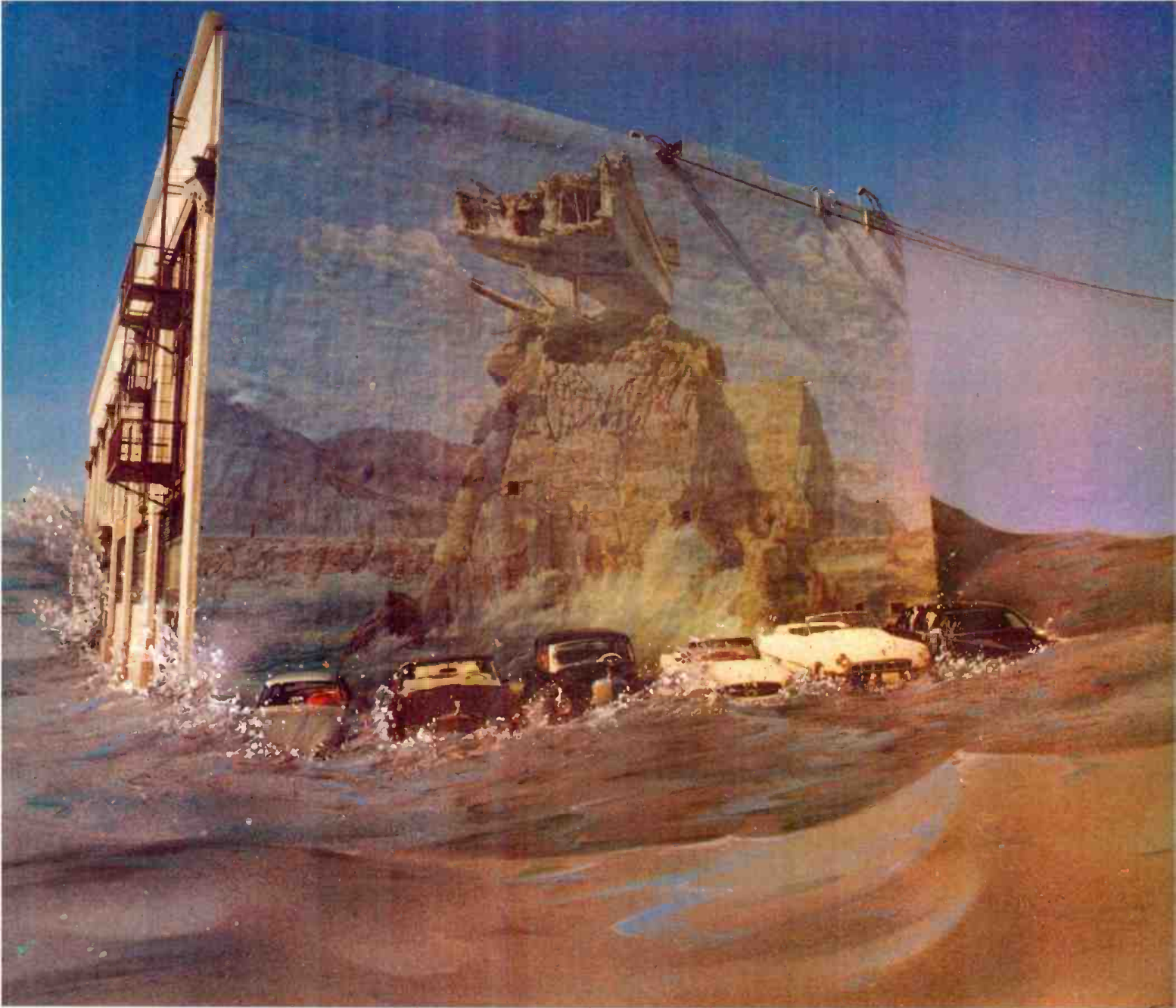
The Evaluation Criteria

The logical criteria for evaluating the tolerable magnitude of any distortion type is exceedingly simple in concept, but require a bit of groundwork to implement. The criteria? — "Are the signal alterations or distortion products *audible*, within the

Figure 1



Fletcher-Munson curves (USA).



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STUDIO D.

THE VILLAGE RECORDER
(Now, how about Studio B?)

Noise & Distortion

anticipated use confines of the device." In short, can we perceive the difference?

Before we can hope to assemble useful information pertaining to the audibility of various signal components, we must first understand the human hearing mechanism.

The Ear

Humans hear sound whose frequencies range from around 20 Hz to 20 kHz. However, the precision with which the ear responds is no match for flat frequency response and low distortion figures which we are accustomed to measuring in audio electronic circuits. In fact, the ear is a rather "imperfect" device which exhibits, for instance, a strong level vs. frequency non-linearity, as well as a rather unpredictable response which varies from day-to-day, depending on the nature of the sounds to which it is subjected, and from year-to-year, as it deteriorates.

On the other hand, the ear is an acute measuring device, often capable of detecting anomalies in reproduced sound which might take very complex arrays of equipment to verify. The ear performs the functions of a real time spectrum analyzer, distortion test set, noise meter and other apparatus, on a full time basis. The results, while terribly accurate in terms of numbers, are acute, and leave the listener with definite impressions relating to the audible effect of the various distortions which might exist in the reproduced sound to which he is listening.

Good or bad, the ear is what we hear with, and the fidelity of any audio reproducing system must relate to satisfying the ear's idiosyncrasies rather than to some arbitrary system of numbers or percentages.

Since, however, we are required to specify our equipment in terms of numbers in order to have a basis for comparison, it is of concern that we attempt to make those numbers relate, as much as possible, to the ear's ability to perceive. That, in short, is the purpose of this article.

The Fletcher-Munson Curves

In Figure 1, I have reproduced the familiar Fletcher-Munson curves,¹ which are intended to portray the SPL levels determined as necessary to relate to a given series of loudness levels, as perceived by an average person of normal hearing.

The ASA "A" weighting filter, which is sometimes used for measuring noise levels, is based on the inverse of the 30 phon curve of the Fletcher-Munson family. The "A" filter presume typical noise levels will fall in this approximate region, where the ear's sensitivity to the low and high frequencies is diminished, relative to the middle frequencies.

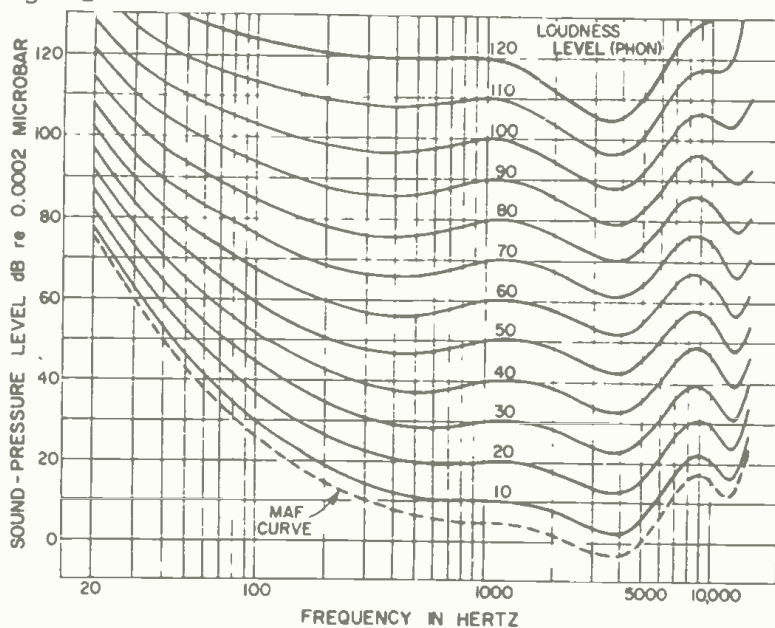
Of late, it has been felt by many authorities that the ASA "A" weighting characteristics have not given a subjectively correct representation of noise spectrum associated with professional equipment.² This is particularly evident when dealing with high frequency noise in the presence of program material.

Considerable research was done on this subject by Dolby Laboratories, who ultimately produced the CCIR-ARM measurement method, which is an adaptation of the CCIR curve, modified to use a simple average respond meter (ARM). Dolby also chose to reference the "0 dB" point at 2 kHz in order to yield familiar

sounding numbers on typical equipment. Numbers which correlate to the measurement of white noise over a 20 Hz to 20 kHz bandwidth. (The original CCIR method utilizes a complicated quasi-peak meter, and yields noise measurements some 10 to 12 dB worse than those commonly published by audio manufacturers.) A paper on this subject appears in the March, 1979 *AES Journal*.²

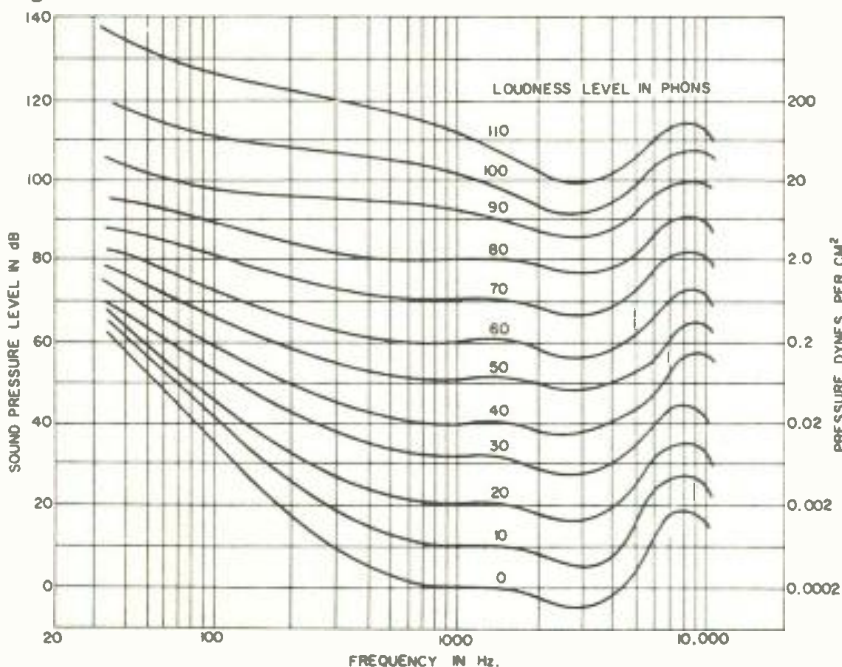
In conducting my own research into the subject, I examined not only the familiar Fletcher-Munson curves, but also those of Robinson & Dadson (England) (Figure 2)¹, and Churcher-King (England) (Figure 3). These curves pretty well agree with each

Figure 2



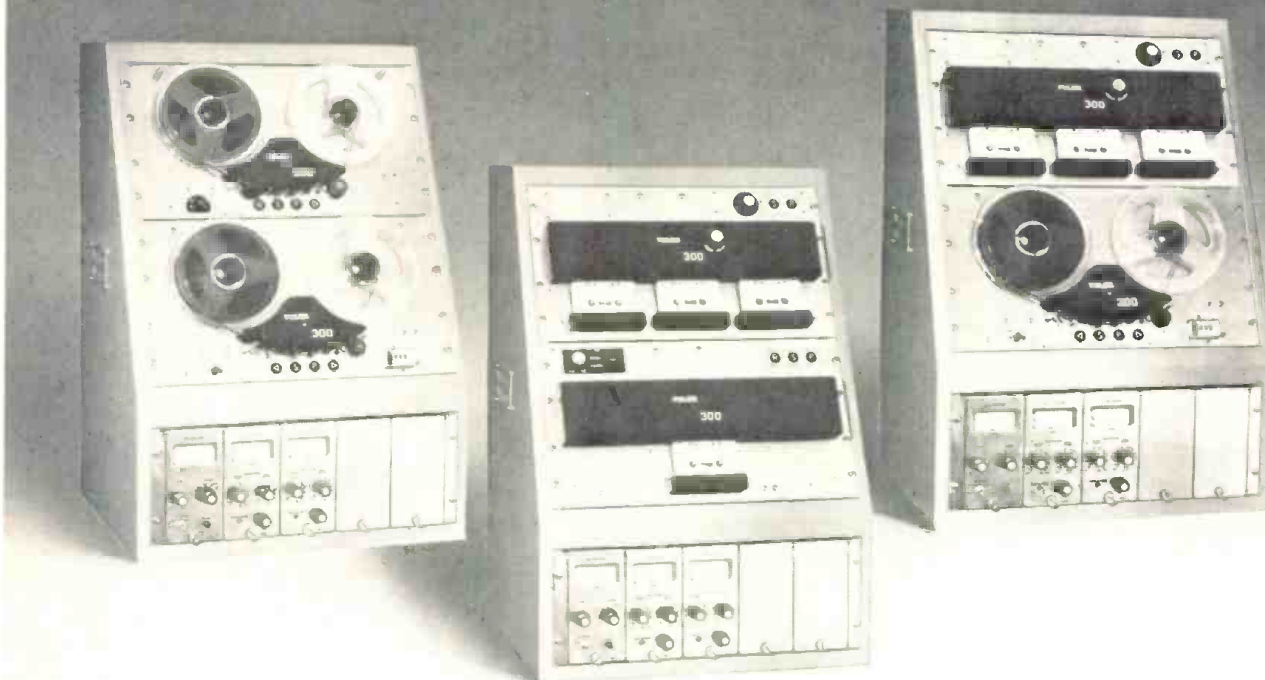
Robinson and Dadson free-field equal loudness contours. Observer facing the source of sound.

Figure 3

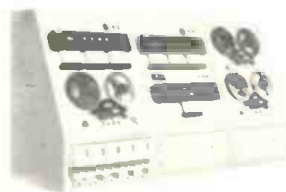


Churcher-King curves (England).

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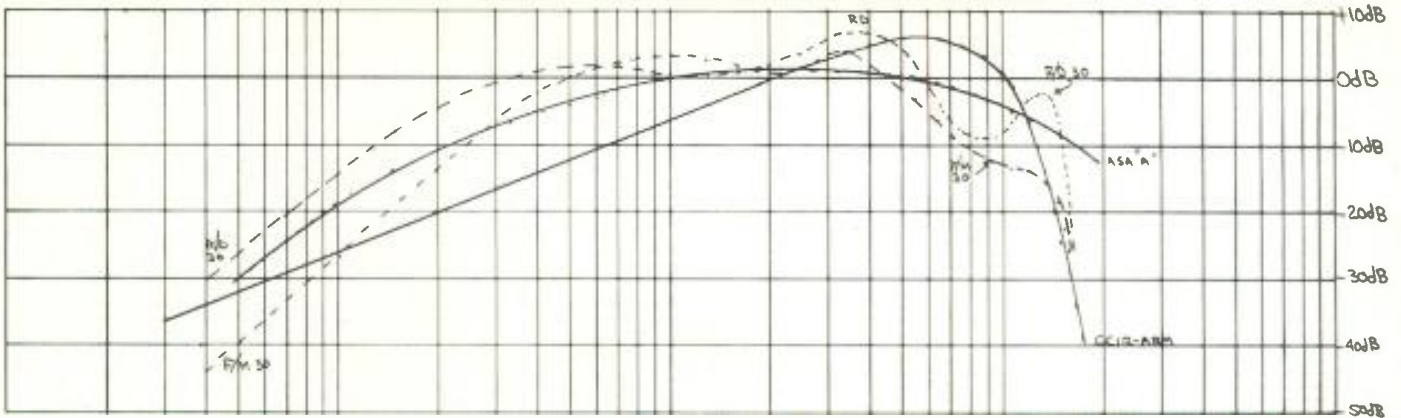
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Figure 4: INVERSE OF FLETCHER-MUNSON and ROBINSON/DADSON 30 PHON CURVES (normalized to 0 dB) PLOTTED AGAINST ASA "A" WEIGHTING FILTER AND CCIR-ARM WEIGHTING FILTER



Noise & Distortion

other, and show a greater audibility of high frequencies (particularly at 4 kHz and 12 kHz) than do the Fletcher-Munson curves. Perhaps this would have some bearing on the subjective inaccuracy of basing the audibility of noise signals on the Fletcher-Munson curves, via the ASA "A" filter. It is of interest that the Robinson-Dadson curves are specified as "Free field with listener facing the sound source." Perhaps high frequency directionality accounts for the increased HF sensitivity.

I have plotted the inverse of both the Fletcher-Munson and Robinson-Dadson 30 phon curves, together with the ASA "A" filter and CCIR-ARM filter response, in my Figure 4. Notice that the CCIR-ARM characteristic places more emphasis on the high frequencies than does the ASA "A" characteristic.

In notating the apparent discrepancy of the CCIR-ARM filter at mid to low frequencies, one important attribute of common "white noise" must be remembered. That point is that white noise is characterized as having equal energy per cycle of bandwidth, rather than equal energy per octave. Thus, over a 20 Hz to 20 kHz bandwidth, 19/20 (95%) of the noise power is developed in the band from 1 kHz to 20 kHz, while 1/2 is produced in the 10 kHz to 20 kHz band. Noise contribution in the band from 20 Hz to 1 kHz is only 5% of the total.

Whatever the clinical accuracy, the CCIR-ARM curve appears to be a subjectively definitive method for comparing noise audibility of various sources. This is particularly true when one considers that many reproduction means incorporate some degree of "presence" boosting, in the 4 kHz to 10 kHz region, while having some degree of low frequency loss in the speaker mechanism.

For the remainder of this article, I will use both the CCIR-ARM measurement curve and the Robinson-Dadson curves of

apparent audibility as analysis basis.

The Criteria Expanded

In choosing a figure for determining the audibility of noise and other product producing distortion forms, I believe that a criteria which requires the audibility of the noise or distortion product to be at least 60 dB below the audibility of the signal will provide a general rule for excellent transparency.

This is not to be confused with the total dynamic range of the ear, which can cover as much as 130 dB between the threshold of audibility and pain.

The 60 dB criteria applies to noise or distortion in the presence of signal, and depends on the masking effect, or audibility of a weak signal in the presence of a strong one, for its validity.

As for a criteria for noise or distortion in the absence of audible signal, the situation would become more complex, and would depend upon the loudness levels at which the sound were to be reproduced, as well as the ambient noise level of the listening environment. For example, if program material were to be reproduced at a loudness level of 120 phons, in a completely noiseless listening environment, noise levels in the absence of signal would have to be 120 dB below the signal, as measured with a filter whose characteristics complimented the "0" phon curve of the loudness contours, for complete inaudibility.

In a more realistic atmosphere, a signal-to-static noise ratio of 75 to 80 dB should produce excellent "transparency," and seem an effective criteria.

Noise Build-Up

In a system which has many sources of noise, each individual source may be considered as being non-coherent, or random. When dealing with non-coherent noise, the total produced by combining all of the sources must be done on a basis of power contribution, rather than by simply adding up the noise voltages. The formula for summing non-coherent voltages is based on the square root of the sum of the squares, and is expressed $E_T^2 = E_1^2 + E_2^2 + E_N^2$.

Simple mental calculations may be done by remembering that for combining a number of noise sources of equal magnitude, the sum will be 3 dB higher each time the number of noise sources is doubled, as shown by the following table:

Number of Equal Noise Sources	Total Noise (Relative To One Source)
1	0 dB
2	+ 3 dB
4	+ 6 dB
8	+ 9 dB
16	+12 dB
32	+15 dB
64	+18 dB

Let us assume that we are analyzing a 32-channel professional recording console for noise performance, using the 75 dB signal-to-static noise criteria. We will further assume that the original signals from the microphones were noiseless. In real use, these signals will pass through the console not once, but twice. (Once in miking and once in mixdown.) We will assume a final mono output at the customary +4 dB level.

The 32 music sources are assumed to be sporadic and occurring in isolated frequency

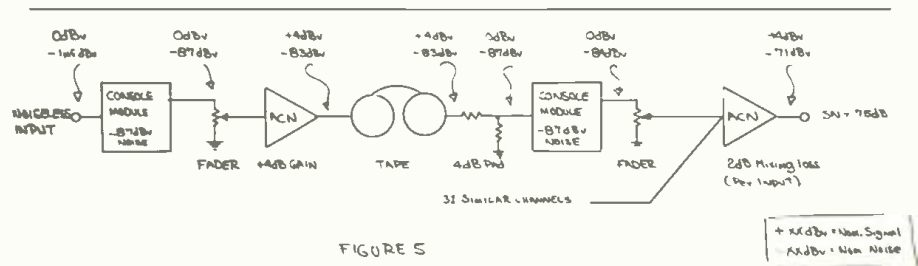


FIGURE 5
NOISE ANALYSIS OF A 32 TRACK CONSOLE FOR 75dB OUTPUT S/N RATIO (ASSUMING NOISELESS SOURCE & TAPE PATH)

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Performance Specs:

Frequency Response:

+0, -1 dB 5 Hz to 60 kHz (1W, 8 Ohms)

Power @ Clipping:

400 W RMS per channel into 4 Ohms
800 W RMS bridge mode into 8 Ohms

IM Distortion:

Less than 0.1%, typically below .04%

Total Harmonic Distortion:

Less than .05%, typically below .02%

Damping Factor:

Greater than 200

Input Sensitivity:

1.3 V for 400 W into 4 Ohms

Load Protection:

Short, mismatch, open circuit proof voltage/current limiting instantaneous with no thumps or cutout.

Speaker Protection:

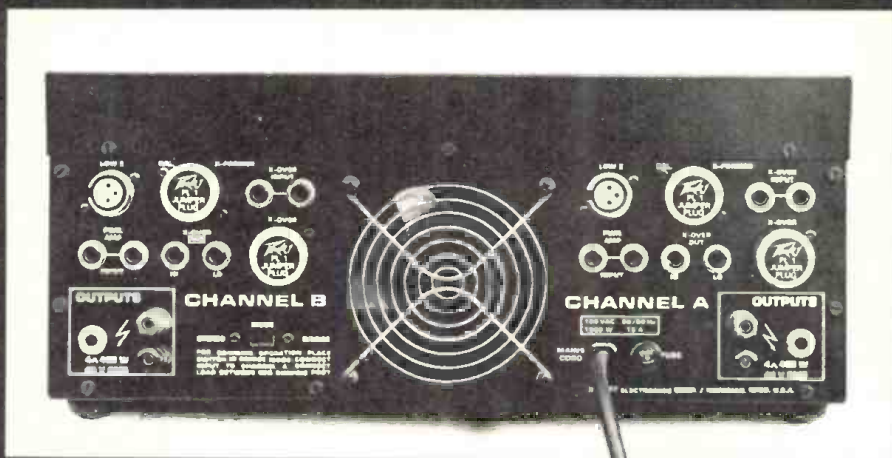
Instantaneous crowbar circuit clamps the output upon advent of amplifier failure.

Cooling System:

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Output Transistors:

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Noise & Distortion

bands, and thus do not add up in accordance with any particular formula. A good rule of thumb for multitrack mixing is to assume that, on the average, each individual signal source will be mixed at a level approximately 6 dB lower than the total output level. This rule, of course, is general, and subject to the content of the music being mixed.

One more parameter must be looked at before we can assemble a model console... that being headroom. In order to assure freedom from clipping the peaks of complex waveforms, the nominal RMS signal level at any audio stage should be kept at least 20 dB below the sine wave clipping point of the stage. Since most internal console stages clip at around +21 dBv, we will assume an internal signal level of 0 dBv nominal RMS.

Finally, in Figure 6 I have assembled a console pictorial which meets the headroom and noise requirements to achieve to 75 dB signal-to-noise criteria.

In referring to Figure 6, it can be seen that, assuming no noise in the mike preamp or tape machine, a signal-to-noise ratio of 87 dB, plus 20 dB headroom, is required at each console I/O module to achieve a final signal-to-noise of 75 dB. It should be noted that this figure should include the entire I/O port, including EQ, etc., and should be measured

with an appropriate filter such as the CCIR-ARM. (If the noise produced by the console is evenly distributed "white noise" the CCIR-ARM filter should yield a similar figure to that obtained with a flat 20 Hz to 20 kHz measurement bandwidth, using high order filters in excess of 30 dB/octave.) (If a simple 6 dB/octave filter is used, the 3 dB point should be 12.7 kHz to approximate a true 20 kHz measurement. The reader should be aware though, that the use of a 6 dB/octave filter will yield deceptively optimistic readings, unless the device under measurement has a flat frequency response beyond 100 kHz.)

Modulation Noise

In certain signal processing devices, a phenomenon known as modulation noise occurs. Modulation noise manifests itself as a noise which appears during the presence of signal, but which is diminished, or absent, under quiescent or no signal conditions.

In keeping with the 60 dB criteria for dynamic signal-to-noise ratio, it is stated that the noise audibility should be at least 60 dB below the signal audibility.

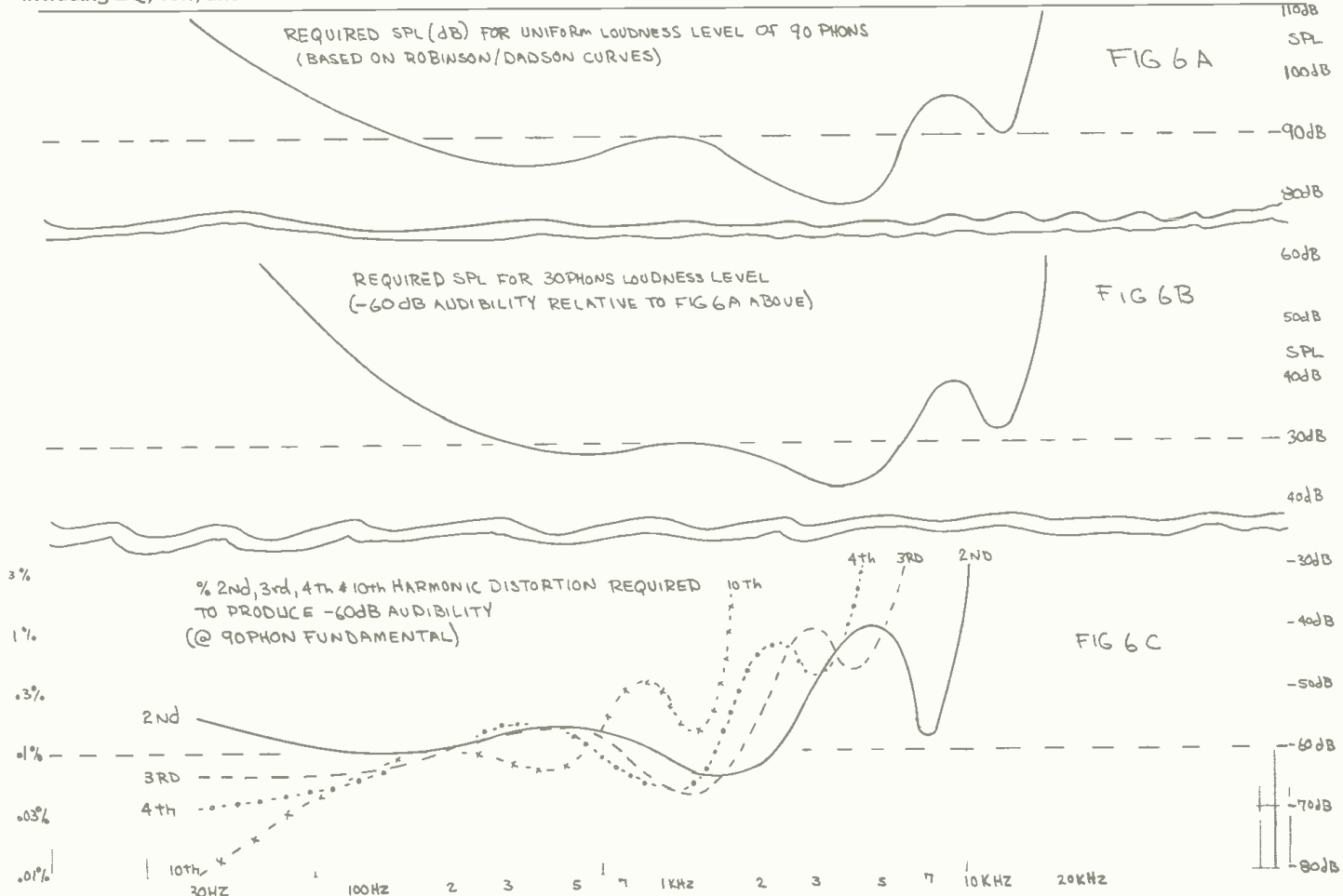
In referring to Figure 3 (Robinson-Dadson curves) it can be seen that, at a listening level of 90 phons, the ear is some 20 dB less sensitive to a 30 Hz tone than to a 1 kHz tone. Thus, if a 30 Hz signal is passed through a device which produces broadband modulation noise, the audibility of the

noise can be as much as 20 dB worse than the measured signal-to-modulation noise. This is so because the signal falls in a frequency band attenuated sensitivity, while the noise fills the entire audible spectrum. Assuming, then, that the modulation noise is closely coupled to the signal, and does not linger after the removal of signal, an 80 dB signal to CCIR-ARM modulation noise will satisfy the 60 dB audibility criteria. Obviously, DC or sub-sonic signals should not be presented to a device which produces modulation noise, as the apparent signal-to-noise ratio will be worsened due to the inaudibility of the signal.

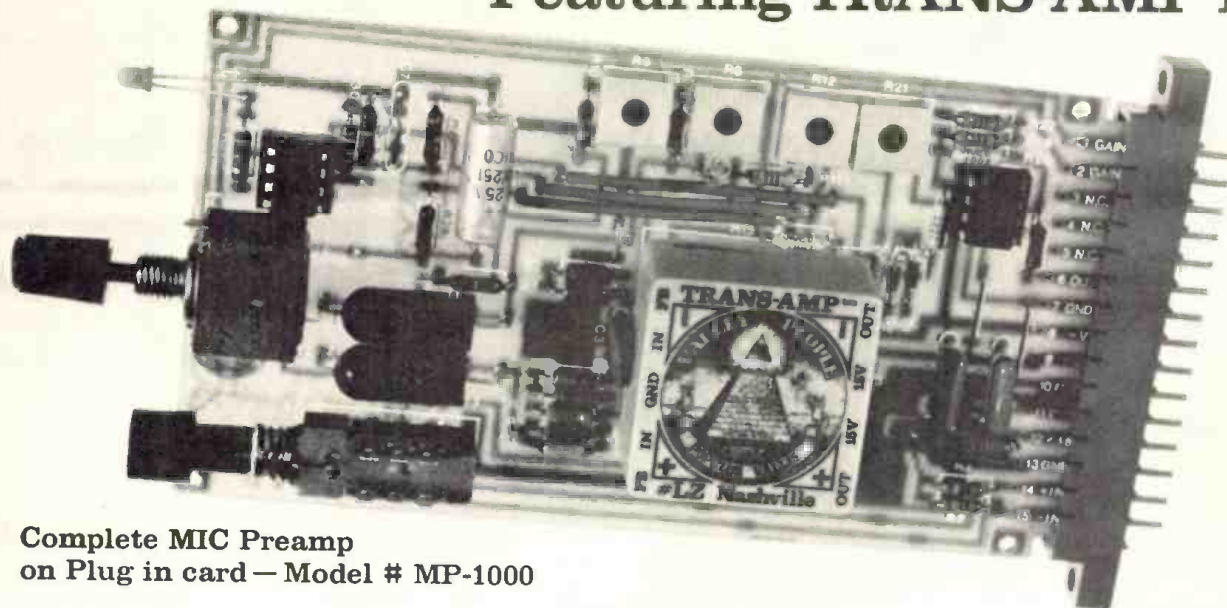
In tape noise reduction and similar gated gain applications, the modulation noise portrays a subjectively higher audibility since it lingers after the removal of signal, due to the necessary release time of such devices. Here, a sharp transient can trigger a lingering modulation noise which becomes more audible after signal cessation, due to the loss of the signal masking effect.

In the Dolby noise reduction system, this effect is minimized by gating the signal in multiple frequency bands so that, for instance, a low frequency signal produces only low frequency modulation noise rather than the more objectionable full spectrum noise.

The dbx system, on the other hand, produces broadband modulation noise, but employs pre-emphasis and de-emphasis to



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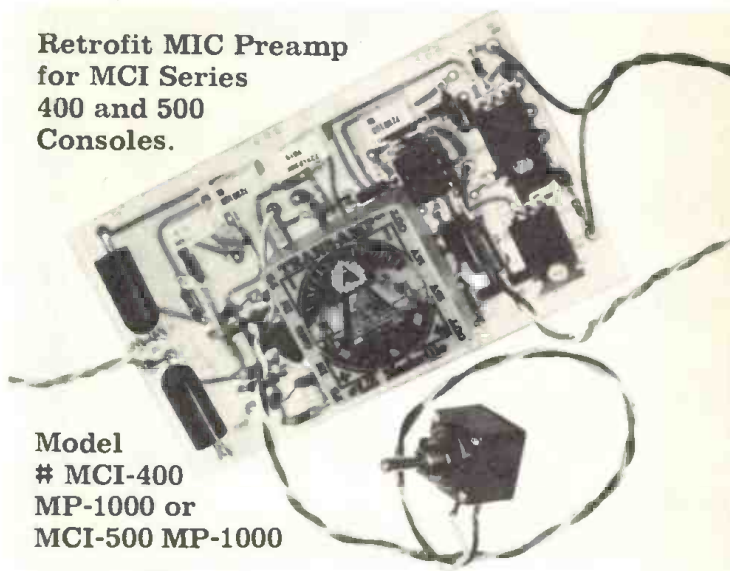
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Noise & Distortion

reduce the subjective audibility of noise induced by low frequency signals.

Harmonic Distortion

When a signal is passed through an imperfect medium, non-linearities in the medium can produce, in addition to the fundamental signal, harmonically related additional signals. For instance, a 100 Hz fundamental will produce a 200 Hz second harmonic, a 300 Hz third harmonic, a 400 Hz fourth harmonic, and so on.

Even ordered harmonics are generally less objectionable to the ear than are odd harmonics, since the second and fourth harmonics form only octave intervals of the fundamental, while the third and fifth harmonics form chords with the fundamental. The seventh and higher harmonics are particularly displeasing since they form dischordant intervals.

In general, single-ended amplifier stages, with relatively small amounts of feedback, (as typified by many vacuum tube stages), produce predominantly even order harmonics. Complimentary or push-pull stages, with large amounts of feedback, (as typified by most op-amp stages), tend to produce predominantly odd order harmonics. This is one reason for the preference by

some, for tube equipment. Tubes tend to produce an ever-rising even order distortion, while op-amps tend to produce extremely low distortion, followed by an abrupt increase in odd harmonics, at the clipping point. It has been said that even order harmonics induce a feeling of "brightness" or "warmth," while odd harmonics produce a lack of definition or a "muddy" or "covered" sound.

While even harmonics may produce a pleasing sound, for some signal sources, their presence is contrary to the specification of a "transparent" signal chain, so they should be eliminated, within the prescribed 60 dB criteria.

In the recording studio, it should be kept in mind that signals are apt to be passed through the console at least twice, and that distortion, as well as noise, can be additive.

In Figure 6, based on the Robinson-Dadson curves of Figure 2, I have plotted the required SPL levels to achieve a loudness of 90 phons and 30 phons. I have also plotted, based on these curves, the amount of measured electrical second, third, fourth and tenth harmonic distortion, which will result in audible products 60 dB below the fundamentals (.1% audible distortion).

In analyzing this chart, it can be seen that the point most reliable for analyzing the lower order harmonics is between 1 kHz and 1.5 kHz, where about .06% second, .04%

third and .04% fourth may be tolerated within the 60 dB criteria.

At the low frequencies, it is seen that progressively higher order of harmonics are more audible, since they fall into regions of greater audibility. Above 2 kHz, we see a diminishing audibility of harmonics, except for an increased sensitivity to the second harmonics produced fundamentals around 7 kHz. Beyond 10 kHz, simple harmonic distortion, by itself, is of no concern.

If we allow for a potential doubling of distortion with two signal passes, a specification around .02% THD at 1 kHz plus an examination for high order harmonics at low frequencies, and for second harmonics at 7 kHz, should satisfy the objective.

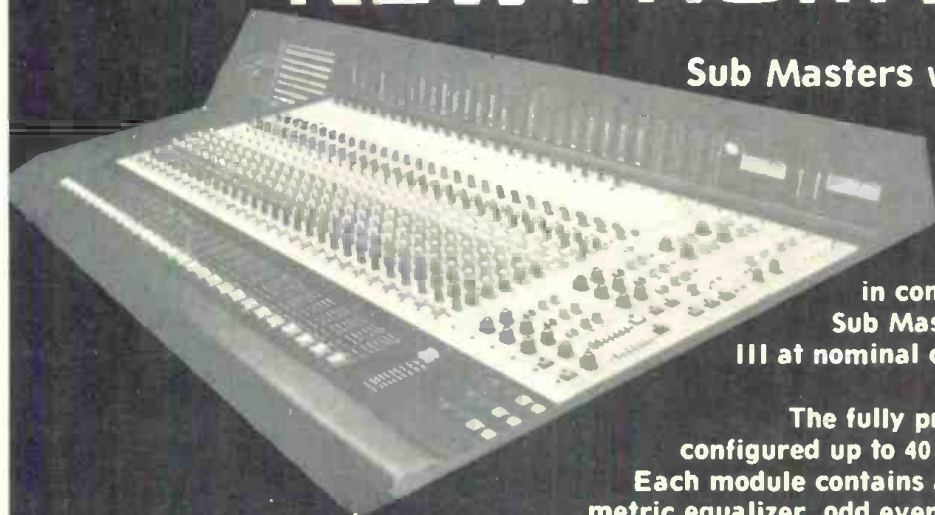
Crossover Distortion

Crossover, of "notch" distortion is a particularly displeasing form of distortion which results from some amplifier designs which have a "dead zone" in their signal transfer parameter. This type of defect was common in early "class B" power amplifiers. Crossover distortion of the classic type is deadly for two reasons:

1 - It manifests itself as a very high order distortion form, which can be very audible when low frequencies are passed, due to the ear's sensitivity to high frequencies vs. low frequencies.

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2 - More important, classic crossover distortion, as a percentage of the applied signal level, rises inversely to the applied signal. Thus, a device with, say, .1% crossover distortion at a loud level may exhibit 10% crossover distortion at a level 40 dB lower.

Crossover distortion is best detected by THD analysis at a low frequency, say 100 Hz, at both a high level and a low level. Waveform spikes, under these measurement conditions, should not exceed .01% of the respective input levels in order to meet the 60 dB audibility criteria.

In some devices, waveform anomalies of such a short duration as to be super-audible may exist. In determining their audibility, the employment of a 20 kHz low pass filter in the measurement chain may be desirable.

For example, a device which produces, say, 1% fifth harmonic from a 10 kHz input imposes no direct audible consequence, since the distortion product exists at 50 kHz and is inaudible.

Twin Tone IM Products

When two different frequencies are applied to a non-linear device, not only harmonics of each input are produced, but also sum and difference frequencies are created. To clarify, let us assume an input of, say, 500 Hz and 700 Hz. The sum and difference frequencies will be $(700 + 500) =$

1200 Hz, and $(700 - 500) = 200$ Hz. As can be seen, these IM products are harmonically unrelated to either fundamental and thus can be quite offensive. Additionally, the harmonics of the fundamentals can intermodulate with each other and with the fundamentals, as well as with the first order IM products, to cause second order IM products. This process can continue, producing third order IM products, or higher, depending on the degree of non-linearity of the device, and the sensitivity of the measuring apparatus. Usually, the production of high order products is predictable, wherein if the first order products are, say, 40 dB down (1%), the second order products will be 80 dB down (.01%), and third order will be 120 dB down (.0001%), etc.

Since IM difference frequencies fall in a spectrum below the fundamentals, distortion above 10 kHz remains important. Assume fundamentals of, say, 12 kHz and 15 kHz. The difference frequency of 3 kHz is audible. This effect, of course, continues well beyond the audible spectrum, and is part of the mechanism which causes RF sensitivity.

An AM transmitter operation at 600 kHz and modulated 1 kHz produces sidebands of 599 kHz and 601 kHz. If these frequencies are allowed to pass through an audio stage, the IM production of that stage will produce

the 1 kHz modulating frequency via sum and difference of the 599 kHz, 600 kHz and 601 kHz, and the radio signal is demodulated, and is audible.

Thus, it is not so much the fact that RF is present, in a piece of audio equipment, but whether non-linearities capable of demodulating the radio signals exist in the audio stage.

A good method of determining the audibility of sum and difference frequencies would be to conduct a simultaneous sweep of two frequencies, separated by a fixed spacing (say, 1 kHz) over the range of, say, 20 Hz to 100 kHz. If the output of the device were then passed through a CCIR-ARM weighting filter, then on to a narrow band spectrum analyzer, the screen would show the audibility of the products produced as the device under test were subjected to the various input frequencies.

My .1% audibility criteria would ask that the CCIR-ARM weighted products, when adjusted for a potential doubling from multiple passes, not exceed .05% of the unweighted magnitude of the input sweep.

Due to the weighting, maximum measurement sensitivity would exist in detection of distortion products falling in the 4 kHz to 8 kHz region, thus relating to the ear's increased sensitivity in this region.

While other measurement methods can and have been devised, the important thing

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Noise & Distortion

to remember is that the objective is to relate the magnitude and frequency of the IM products to our ear's ability to detect them.

For instance, if 21 kHz and 22 kHz were applied, the 43 kHz sum product is of little concern, while the 1 kHz difference product is audible.

Slew Induced Distortion

All electronic circuits exhibit a maximum rate of change to which they may respond to an input signal, due to inherent inductances and capacities. In passive and non-feedback circuits, this parameter simply manifests itself as a high frequency roll-off, which occurs when the input signal is changing faster than the device can respond. This action produces no new signal components or distortion products.

In a feedback circuit, i.e., an op-amp, a different situation exists. Here, the feedback mechanism allows the device to overcome the frequency roll-offs by pumping extra current, as required, to change the stray capacities and inductances. However, the device has a finite limit in the amount of current it may deliver, and ultimately it is unable to supply what is demanded by the feedback mechanism. When this point

occurs, the device ends up by alternately sinking and sourcing all of its available current, thereby producing a triangle wave output, regardless of the shape of the input waveform. This effect is known as "slewing" or "triangulation," and is normally specified either in terms of "slew rate" (volts per microsecond), or full power bandwidth (the highest frequency which may be handled without triangulation, at full rated output).

When slew included triangulation occurs, there is an abrupt increase in all distortion forms, which may reach 30% or so. Normally, triangulation occurs above the audio spectrum, so harmonic products are of no direct concern. However, first, second and third order IM products are of great concern, due to the high degree of non-linearity and the fact that difference frequencies fall into the audio band.

The audible effects of slew induced distortion are most easily detected by using the twin tone IMD test outlined previously.

Preventing Slew Distortion

Obviously, the best way to prevent slew distortion is to limit the frequency range of input signals to those which may be passed through the audio chain without the onset of triangulation. Failure to do this is probably the biggest single area of neglect in certain consoles available today.

It should be kept in mind that, for an

amplifier with a given slew rate, the highest frequency which may be passed, without slew induced distortion, is inversely proportional to the applied signal level. Thus, an amplifier with a 1.6V/microsecond slew rate (such as a 4136, 4558, 4741, etc.) may handle around 16 kHz at a +20 dBv level, 32 kHz at +14 dBv, 64 kHz at +8 dBv, etc.

Accordingly, if an input filter, of appropriate parameters to insure these maximum levels, were incorporated, everything would be okay, in theory. But... the inclusion of console EQ can, and often does, undo the roll-off of an input filter, and the result can be an obnoxious amount of mush introduced by slewing.

The solution? The specification of slew rates sufficient to pass at least 100 kHz, without slew induced distortion, at a level 20 dB above the nominal signal level, at any point in the console.

This specification is very easy to meet, without resorting to discrete transistor op-amps, thanks to a number of recent op-amps offering slew rates around 13 V/microsecond, such as the TL070 series, LF353, NE5534, etc. One point of caution... the widely used NE5534 is sometimes externally compensated for increased stability. In such cases, the slew rate can be deteriorated to around 4 V/microsecond, thus reducing the full power bandwidth to below 40 kHz.

TIM Distortion

TIM, or Transient Intermodulation Distortion, is a phenomenon which results when two signals are passing through an amplifier in such a manner that one or the other, or both, cause momentary slewing, or uncontrolled maximum current deliverance, due to slew rate limitations of the device. Obviously, if one signal forces the device beyond its linear region, the other signal cannot be faithfully reproduced, as the feedback mechanism is no longer effective. While various measurement techniques have been advanced for the detection of TIM, my personal observation is that the phenomenon is essentially one and the same as the slew induced triangulation characteristics just described. I would suspect that a device which passes the twin tone IMD test, at high frequencies and high levels, will also be shown to exhibit no audible TIM. I don't consider myself an expert on the subject of TIM, and hence, would acknowledge the advancement of further information by anyone who might be more versed in the subject.

SMPTÉ IMD

When two signals are presented to a device, there is an additional effect beyond the production of sum and difference frequencies. This effect is the amplitude modulation of one signal, by the other.



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Particularly irritating results are produced when a high amplitude low frequency modulates the envelope of a lower level high frequency signal. Most of us can probably equate this to having heard a drum track where the cymbals buzz with each bass drum beat. The high amplitude of the bass drum is envelope modulating the cymbal signal.

In an SMPTE IMD analyzer, the device under test is fed a 60 Hz signal and a 7 kHz signal, with the amplitude of the 60 Hz signal being four times the amplitude of the 7 kHz signal. The analyzer then looks at the envelope of the 7 kHz signal, at the device output, to determine what percentage of high frequency amplitude modulation has been induced by the larger amplitude low frequency.

The results of a proper SMPTE IMD test correlate very well to my audibility criteria, after allowing for a potential doubling of distortion for multiple passes. Thus, .05% SMPTE IMD is a good figure to meet the .1% audibility criteria.

Phase Response

In itself, the phase response of various frequencies has no effect on the perceived sound. This statement may be substantiated by mentally recording music on a hypothetical tape recorder. If you were to reproduce your recording 1 millisecond after the

original performance, you would have a 360° phase shift at 1 kHz, 3600° at 10 kHz and 36° at 100 Hz. If you played it 2 milliseconds after the performance, you would have 720° at 1 kHz, 7200° at 10 kHz and 72° at 100 Hz, yet the music would sound the same during both replays.

The problem shows up only when you pass the same signal through two or more signal paths, which exhibit different phase relationships.

For instance, if you pick up the same sound source with two microphones, drastic alterations in the perceived sound may be realized by moving one microphone only a few inches, relative to the other. Acoustic delays in the signal paths from one mike to the other will cause nodes of reinforcement and cancellation, due to the unequal phase relationships of the two received signals.

Amplifier phase relays act in exactly the same manner. As long as the signals are totally isolated and never travel in parallel paths through two or more circuits, the phase response of the circuits is unimportant.

In a real system, we cannot assure the above restrictions will be met, so it is wise to minimize the phase shift of all amplifiers in a system such that cancellation and reinforcement nodes will not develop if a signal is allowed to take two parallel paths.

A 10° difference in the phase of two

circuits, at a given frequency, will cause a .13 dB error when a signal of that frequency is passed through the two circuits, then recombined. Accordingly, it would be wise to configure a system such that no more than 10° to 15° phase shift would exist at 20 kHz or lower, at any stage, so that the operator might have freedom to route the signal where he desired, without fear of frequency response anomalies caused by unequal phase delays.

Closing

While I have covered only some of the distortion and noise forms mentioned in the earlier portions of this article, space does not permit covering all possible parameters. What I hope to have accomplished is some clarification of the more common types, as well as the reasoning behind my criteria for emphasizing the audible affects rather than the laboratory numbers.

I am sure that much can be added to the thoughts and explanations presented here.

□ □ □

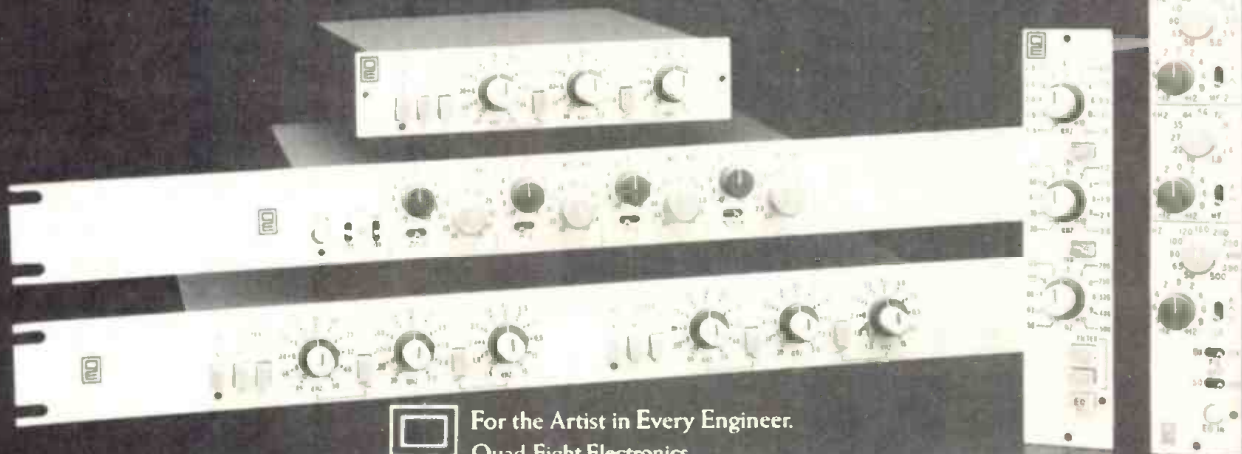
¹ *The Audio Encyclopedia* — Howard Tremaine, published by Howard Sams & Company.

² *CCIR-ARM, A Practical Noise Measurement Method* — Ray Dolby, David Robinson, Kenneth Gundry. *Journal of the Audio Engineering Society*, Vol. 27, Number 3, March 1979.

Note: Loudness graphs reproduced from *The Audio Encyclopedia*.

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MULTI-TRACK RECORDERS: A Comparative Table of the Equipment Most Often Found on the Current

Machine Number and Approximate Years of Manufacture	Tracks, Heads, Reel Size	Reeling Motors and Braking Handling Style	Capstan Motor and Vari-speed	Speeds and Equalization
Scully 288-16 (1969-1972)	8 track, 1"; 16 track, 2" Pluggable head assembly. (12 track machine was made as interim machine.) Nortronics 10 1/2" reels.	60 Hz torque motors. Tension set by applied voltage to reel motors. Motion sensing; disc brakes.	60 Hz Hysteresis/Synchronous External Vari-speed drive by 60 Hz variable frequency oscillator and power amp. Martin Vari-speed III.	7 1/2/15 or 15/30 ips. NAB EQ stock as in 280 style electronics. Some modified with 5 kHz adjusting point.
Scully Model #100 (1971-1974)	8 track, 1"; 16 track, 2" Pluggable head block. Two-head machine. Erase/Record/Play. Nortronics 10 1/2" reels.	60 Hz torque motors. Motion sensing; disc brakes.	60 Hz Hysteresis/Synchronous External Vari-speed as above.	Standard 15 ips single speed. Capstan motor has second winding for 30 ips. EQ can approach correct curve with circuit modifications. Use of both speeds impractical.
3M-56 (Originally Model 401) (1969-1972)	8 track, 1"; 16 track, 2" Pluggable head assembly with shields. Rotating 1"-2" tape guides. IEM mostly. 10 1/2" reels.	DC spooling motors with dynamic braking. Direction sensor by magnetic reed switch beneath supply motor. Any mode to stop.	60 Hz Hysteresis/Synchronous External Vari-speed as above.	7 1/2/15 or 15/30 ips. NAB (CCIR, or combination, rarely).
3M-79 (1972-present)	8 track, 1"; 16/24 track, 2" Pluggable head assembly with shields. Rotating 1"-2" tape guides. IEM early; 3M later. 10 1/2" reels.	DC controlled spooling motors. Adjustable reel tensions and mode response switch. Direction sensor; dynamic braking.	DC servo motor. Internal Vari-speed, 6-36 ips. No readout. External Vari-speed by DC level adjust, from +Vcc to ground. Readout in per cent or ips from image transformations.	Standard 15/30. NAB, CCIR, or combination.
Ampex MM-1000 (Descendant of AG-1000) (1967-1972)	8 track, 1"; 16/24 track, 2" Pluggable head stacks and guides. Nortronics and Saki heads (fixed) 10 1/2" reels.	60 Hz reeling motors, (1" or 2"). Motion sensing. Banded brakes.	60 Hz Hysteresis/Synchronous Replaceable with DC servo kit (see MM-1100). 60 Hz Vari-speed by external oscillator and amp or Ampex motor drive amplifier with pitch control by 1/2-tones.	With 60 Hz motor 7 1/2/15 or 15/30 any NAB, CCIR combo on plug-in EQ cards. With servo see MM-1100.
Ampex MM-1100 (1973-1977)	8 track, 1"; 16/24 track, 2" Pluggable head stacks and guides. Ampex heads. Nortronics 24 track erase head (fixed). 10 1/2" and 14" reels.	AC motors, DC controlled. spooling motors. (1" or 2") Motion sensing, rewind or fast forward to play.	DC servo. External Vari-speed by 9.6 kHz square wave oscillator, or Ampex VS-10 in 1/2-tones with readout. Can be driven by several of available video or SMPTE synchronizers.	Any two speeds (adjacent or not) any NAB or CCIR combo on plug-in EQ cards. 1 1/2 to 60 ips. Servo card has strap for speed selection.
Studer A-80 MK I (1971-1974) and MK II (1973-1977)	Mono - 24 track with proper heads and guides. Heads by Studer. 10 1/2" reels.	AC motors, DC controlled. Tension set by incoming and outgoing variable dampers. Motion sensing, fast modes to play. Dynamic brakes with back-up banded brakes.	MK I - LC oscillator, 800/1600 Hz. DC servo. ± 2% internal Vari-speed. External Vari-speed by potentiometer. MK II - 555 oscillator, 800/1600 Hz. DC servo. ± 30% internal Vari-speed. External Vari-speed as above.	7 1/2/15 or 15/30 ips. NAB/CCIR switchable. MK I - preamp and EQ on o. card for changeover. MK II - EQ swaps separate from preamp.
Auto-Tec L-16 (1970-present)	8 track, 1"; 16/24 track, 2" Pluggable heads and guides. IEM heads. 10 1/2" reels.	AC torque motors. Motion sensing. Banded brakes.	Dual capstan (one on either side of head assembly). 60 Hz Hysteresis/Synchronous External Vari-speed by 60 Hz amp. or Martin Vari-speed III.	Any two or three speeds (custom three speed motor) upon request. Most 7 1/2/15 or 15/30 ips. NAB or CCIR.
MCI JH-10, JH-16 (1970-1973) Serial #1-105	8 track, 1"; 16 track, 2" some 24 track 2". Pluggable head assembly. Applied Magnetics. Nortronics heads. 10 1/2" reels.	AC constant tension reel motors. Motion sensing. Dynamic braking with back-up banded brakes.	60 Hz capstan motor. External Vari-speed by 60 Hz oscillator and amp. or Martin Vari-speed III.	7 1/2/15 or 15/30 ips. NAB or CCIR on plug-in EQ cards. (1)-Play and (1)-Record. EQ cards compatible with Ampex MM-1000 and MM-1100 EQ slots.
MCI JH-100 (1973-1975) Serial #106-260	8 track, 1"; 16/24 track, 2" Pluggable head assembly. Applied Magnetics & Nortronics. 10 1/2" reels.	AC constant tension. Motion sensing. Dynamic brakes and banded brakes back-up.	DC servo motor. Internal Vari-speed without readout. (See TVI.) External Vari-speed by 19.2 kHz square wave.	As above.
MCI JH-114 (1975-present) Serial #261-799	8 track, 1"; 16/24 track, 2" Pluggable head assembly. Applied Magnetics record and play. Wolky staggered erase head. 10 1/2" and 14" reels.	DC servo'd reeling motors. Motion sensing. Dynamic DC braking and back-up banded brakes.	As above. Tape velocity indicator (TVI) as optional speed select. Vari-speed control, and Vari-speed readout in ips.	As above.
Stephens 16 track, 1971 24/32/40 Track, 1975	16/24/32/40 track, 2". Pluggable head assembly. Heads by Applied Magnetics. #103 deck - 10 1/2" reels, #104 deck - 10 1/2" and 14" reels.	DC servo'd constant tension reeling motors. Motion sensing. Dynamic braking.	No capstan motor. Constant speed attained by monitored frequency-voltage conversion and idler pickup. Vari-speed by DC level shift in constant tension circuit.	15/30/60 ips. Most supplied with NAB.

Evolution of the Vintages, Capabilities and Features of EQUIPMENT WITH A PAST' Market

by Winn Schwartau

Electronics	Remotes and Locators	Features; Options; Trivia; and Things That Don't Fit into Any Other Category
280 style electronic with 6 position selector switch (Sync-Master). Interchangeable with all similar 1, 2, 4 and 8 track machines. Has "de-click" card added for slow bias turn-on.	Sync-Master remote for full electronics and rack control. Input monitor on record command.	To insure "Bias-Lock-up" between channels, place a 100-ohm 1/2-watt resistor on the bias board from: PIN F (sync) and 1N270 diode. Each electronics has its own bias oscillator, and if the diode blows, each oscillator becomes "free-wheeling" and can cause whistle on tape. Originally supplied deck had a 2" tape wiper in the path to remove excess oxide. Each electronics has its own "mike" input with preamp.
Single bias oscillator. Adjust for all 16 channels. One card for each channel record/play.	All electronics and deck controls are on a 1 3/4" x 19" panel on the front. A "remote" switch on the front plate places full facilities on a similar remote panel. A remote counter as an option without return to '0'.	*Some 100 cards have a "record calibrate" adjustment. Earlier cards do not. A mixture of both cards can cause level discrepancies. Because there is only one head for record and play, record alignments will take longer to accomplish. No XLR input/output. All In/outs on multipin connectors.
All control front panel accessible. Relays accessible from electronics bay. Several different record/play/bias cards for easy maintenance.	Local deck control. All electronics control by remote package with deck controls. Full monitor logic. Selectake I, single memory, thumb wheel entry. Does not read real time. Shuttle type.	Isoloop tape path for minimum unsupported tape path. Changing head assemblies may be somewhat cumbersome and time consuming. Dual idler around central capstan. Strobe disc on reversing idler.
Single electronics card for each channel. Has sync playback EQ controls. Full FET switching.	Remote electronics and deck control can be fit in machine or placed remotely. Full monitor logic. Selectake II, 9 position keyboard entry memory; position and location display. Records minutes and .01 minutes.	Isoloop tape path. Signal electronics extender card with each machine. Has mute circuit for no fast mode "squeal." Dual idler system on either side of capstan. Strobe disc on reversing idler. Speed adjust top plate accessible.
440 style electronics, interchangeable with 440 tape machines. Early machines do not have monitor logic. Monitor logic updates on early machines, and built-on later MM-1000s is common.	Some MM-1000s have full electronics control with monitor logic. First locator was built by Eventide Clockworks, and had return to '0'. Shuttle type.	Mechanical counter on outgoing idler. Separate Sel-Sync switching panel with Sel-Sync level and adjust and bias trap circuits. MM-1005 is a playback only machine. Optional "mike-pre" octal plug in unit for each channel. 24 channel MM-1000 had separate rack of 8 electronics.
440 style electronics cards. Meter panel on separate drawer. Improved cards will work in MM-1000 and 440. Set of three cards plug into channel switching card. Four channels contained in one housing.	Single point computer/locator replaces mechanical counter as in MM-1000. Multipoint search to cue as option. (20 locations).	PURC as option. Causes erase current to turn on after record bias. Wideband SMPTE playback cards available. Video lock available. When used for remote electronics control, local panel is placed where desired by extender cable and replaced with a deck only control box. External Varispeed accessible by 6-pin cinch plug on rear.
*MK I - Output line amp Studer A101 hybrid. MK II - output NE5534 MK I - VU meters have no lights and protrude 1/2". MK II - VUs are backlit and flush mounted.	Optional - full electronics and deck remote with monitor logic. Locator for return to '0', and a dial in memory position.	*Head impedance changed slightly between MK I and MK II. Each speed has individual bias adjust and level adjust. TLS-2000 Synchronizer for SMPTE code. New 20 position memory retro-fittable into older machines. Staggered erase head.
Has sync EQ adjustments. Single electronics card each channel.	Full deck and electronics control. Monitor logic standard with auto-sync.	Dual capstan system keeps constant tension across heads. Capstans must be perpendicular to deck, and diameter tolerances of capstans must be held tight to insure proper performance.
Early: JH-5/JH-8 electronics in packages of 8 with full switching. Similar to 440 style cards, card in some cases interchangeable. Later (1972-1973): Meters above deck. All cards (440 style) in rows beneath deck.	Full electronics remote. Most have full monitor logic. AutoLocator I, 1971, has return to '0' and one memory location.	Packaging in the JH-10/JH-16 changed when JH-8 electronics were no longer used. The later JH-10s used a steel cabinet similar to the JH-100 and JH-114. Mostly 16 channel machines were made. A few 8s and 24s were manufactured. The 24 channel JH-10s in the steel cabinets were wider than the 16 channel variety to accommodate the 8 additional rows of cards. Early JH-10s take on a variety of shapes, but most were in custom wood cabinets. Some playback only machines were built.
Improved 440 style cards. Generally interchangeable with JH-10/16 machines. Electronics on slide drawers of eight channel each beneath deck. May be updated with flux card.	Electronics remote. AutoLocator II with tape position, locate position, keyboard entry and memory. (Minutes and hundredths of minutes readout.)	Introduction of MUC, for joystick control of reeling motors. Optional JH-38 sync unit for 60 Hz, vertical sync, or 19.2 kHz references. May be updated with FET switching, replacing relays. Late version of JH-100s have flux cards.
Improved 440 style cards. Interchangeable with JH-100. All FET switching. 8 channel slide drawers beneath deck.	AutoLocator III with TVI. TVI readout in 1/2-tone steps. Real time readout. 10 Memories. Dual readout.	MUC. QUIUR (slow bias rise and fall similar to Ampex PURC), on all JH-114s from late 1977 on. Flux card optional. Has ± 6 dB precision step adjustment to preclude compatibility for different recording levels without complete realignment. (Can be put into JH-100s.)
Hybrid style op-amps by Stephens. #614 - 1964-1968 #618/620 - 1968-present. Small electronics package makes simple adjustments.	Some machines have full electronics remotes. Multipoint location source introduced in 1977.	From 1964-1971 Stephens built electronics and supplied machines with primarily 3M decks. (Telefunken and Ampex were occasionally used.) First 16 track in Hollywood in 1968 with 3M #56 deck. Entire machine can be run on car batteries for remote use. Stephens still uses isoloop design in tape path, although without a capstan.

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left upright: American D9-AT (30's-40's) horizontal, reading down: Sony C-220A (early 60's), Beyer M-130 (late 50's) Philips 6D40 (40's), Fairchild F-22 (mid 50's, early 60's) right upright: Sony C-107 (early 60's)

THE VINTAGE AUDIO GEAR MARKET

EQUIPMENT with a PAST

By
Winn Schwartau

There is one area of professional audio which, although extensive and highly active throughout the industry, has not attracted the respect and technical attention it deserves. The brokerage field, or the buying and selling of used equipment, has permeated virtually every professional or semi-professional facility nationwide, yet there is as of this date, no consolidated comprehensive manner in which to have sales and technical information reach the consumer. How big the brokerage business is at this point is difficult to determine, but it surely occupies a major portion of the equipment sales made annually to audio and related fields' facilities. And it is growing rapidly.

The nature of the used equipment business is by and large determined by the advances made in state-of-the-art equipment development. As new technical leaps

are made in both the hardware and software of equipment design, and ergonomics begins to actually mean something, instead of something to be looked up in the dictionary, a form of "obsolescence" sets in. The newer gear appears to be more desirable to both the engineers and producers and the equipment that has so well performed for all these years, is now ready to be sold and replaced with the new 'Gizmo.' In our

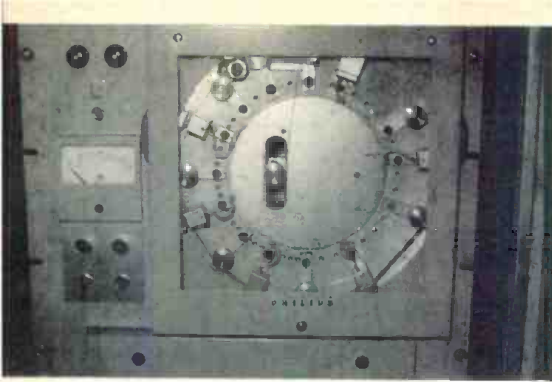
"The Telefunken ELAM 251. It's a bright, open sounding microphone and the prede-predecessor of the AKG-414."

Bill Schnee
Independant, Hollywood

industry, however, obsolescence does not at all imply or mean that the equipment being replaced is unfit for recording applications.

Many of the major recording and broadcast facilities regularly purchase used equipment for their facilities. They may do this to save a little money and keep their maintenance staffs busy, or as is very often the case, they actually prefer some of the older gear to suit their purposes. This is particularly true of outdoor gear and microphones. For example, LA-2As (of which there is a limited re-manufacturing effort presently underway) or Pultecs (which have also periodically been re-made in limited quantity) will always have a market because of their characteristic sound, and many of the vintage condenser microphones now have values far exceeding their original

— continued



Philips multi-delay tape machine (1960-65)

Courtesy of Canyon Recorders

— author —

Winn Schwartau is a native of New York City. He got into professional audio in 1969, at the age of 16, at Mirasound Studios. In the following years he has worked in various aspects of the recording industry at a number of prominent New York studios.

Currently, he is president of Empirical Audio, a New York based engineering firm which is now involved with studio design and installation, custom engineering, brokerage consultation and East Coast distribution of Trident products.

price. Telefunken ELAM 251s are selling for as much as a thousand dollars, and buyers fight over mint condition tube versions of the Neumann U-47.

Brokers (professional used equipment dealers) see a great deal of the older equipment from the tube days, (twenty odd years ago), selling for much more than the gear sold for new. Generally there is a depreciation of equipment value over a period of time (as any leasing company will show you), but this is just an accounting technique. The actual value of the equipment in the street is what the used market cares about, and for that reason the supply and demand ratio for a particular piece of equipment will dictate its going price.

On the other hand, some of the newer consoles and machines made today, that often sell at amazingly low prices, can severely cut the value of older yet workable pieces of gear. Before the audio industry got so assembly-lined in manufacturing, equipment was often handmade which simply costs more. This custom made gear, which may have cost a pretty penny when it was made, may, in fact, be only worth a fraction of its original sales price. (Remember the first calculators with only 4 or 5 functions? They sold for up to \$100

each. Now, you may purchase a multifunction calculator for under \$10. The original may be worth \$100 again someday, as a collector's item.) Fluctuations of such a nature are not all uncommon and therefore the broker must keep a constant vigil on the market value of the equipment he is representing.

As most of us know, building a studio, or other audio related facility involves the purchase of quite a myriad of components. There are two major pieces of equipment: the mixing desk, and the prime multitrack machines, around which the rest of the facility is designed. These two pieces will require the greatest outlay of monies and a good deal of attention should be paid to the quality of the purchase.

"The Neumann U-87 is a much more convenient microphone to use but the U-67 is far better for my taste. It's much fatter sounding. The 87's are thinish by comparison. When ever possible I'll use the U-67."

Don Puluse
C.B.S. Studios, New York

Many people ask if buying a used multitrack machine or console is as good as purchasing new items. The answer is unfortunately yes and no. It is not as good from the standpoint that the equipment is older, does have a certain amount of use and will perhaps require certain parts change to upgrade it to current standards. It also will not have the manufacturer's warranty behind it. Also, the newer gear tends to attract a clientele who are impressed with the newest and best of everything. However, used equipment is just as good as new, if you fit into the category that a majority of studios find themselves:

- A startup business with little street trade.
- A studio whose prime work will be internal production and impression is not as important as performance.
- A short supply of cash or credit.
- The older gear fits your needs better from either a sound or operational standpoint.

In fact, by buying and setting up a studio with used equipment, you can easily achieve a very technically competitive facility for quite substantial savings over new purchases. The major pieces of gear often sell in excellent condition for less than half what you would have to pay for the equivalent in new equipment.

If the gear is being purchased for a facility overseas there is the additional savings in that many countries have a lower import duty rate for used equipment.

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Kitty Puckett checks out 45 rpm stamper, while auditioning one at 33 1/3 rpm.

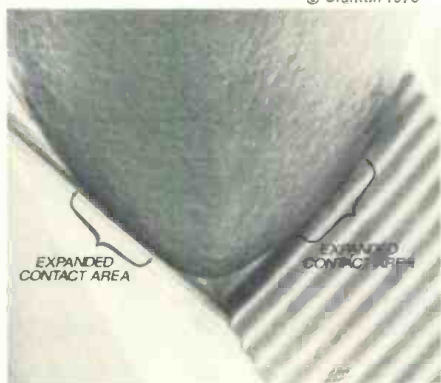
The Nashville Record Production Inc., uses Stanton exclusively throughout its two Disc Cutting Studios. Naturally, they are mostly involved with Country Music, but they also get into Pop and Rock.

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Scanning Electron Beam Microscope photo of Stereohedron® stylus. 2000 times magnification; brackets point out wider contact area.

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R-e/p 102

scrounge around, or have your broker do it for you, you can find everything on the used equipment market that you can find in the retail store; all for a lot less. Remember that someone else's junk is your gold. Some recent studio installations have decided to purchase practically everything on a used basis, including lighting panels, gobos, and yes, even control room and vocal booth glass windows. What generally happens in the "new-used" studio is that it takes a little more labor to retrofit the equipment from its original application to your needs. If you have the time, old machine harnesses, mike panels (with a little cleaning) and speaker wire are re-useable.

We are not advising building a studio in this manner; we are merely saying that with a little ingenuity, you can do it, and have it come out right.

"I have never heard a limiter do what a RCA BA-6 can do. Because they are so antique they will allow the first attack of a signal to pass and then they'll compress. I love them."

Fred Catero
Automatt, San Francisco

How Does the Used Equipment Market Operate?

There are a number of ways in which you may either purchase or sell used equipment. If you are in a large metropolitan area, with a large recording business, you could simply call your friends and sell, purchase or trade with them or their contacts. Another way to sell the gear is through the classifieds of both the national and local industry magazines and periodicals. Also, local shopping guides that are normally found at shopping centers and musician oriented newspapers often will have a professional item or two.

This is not at all costly — typically \$25 for a small ad — and you can get a large response. You do, however, have to wait up to several weeks for the periodical to be published, mailed and responded to. The advantage here is getting close to the amount of money you want, by not using the middle man, but you also have to do all the legwork and sales response yourself. Selling your own equipment also has the advantage of you being able to represent the product as only you know it; "It worked in your studio, you know its idiosyncrasies and can help advise the potential buyer of the ins and outs." Just be aware: it is work, and everyone that contacts you for your gear is not going to love it as much as you do. He is, if a smart buyer, going to be very concerned with why you are selling.

Another way of either purchasing or selling equipment, is through one of the increasing number of used equipment

brokers throughout the country. Brokers will work with you in a couple of ways. First, if the broker is interested in having the equipment himself, and you are looking for a quick sale, he may purchase the equipment from you outright, or trade you for the gear that you might want. Basically, the two of you strike a deal. A little bickering back and forth and you'll both get what you want. You should be aware, however, that if a broker wants to buy your gear outright, he may not be offering as much money as you could get through a private sale, or the more time consuming brokerage.

The second option, which is becoming increasingly popular, is to list your equipment with a broker, or a number of brokers and have them do the actual saleswork themselves. In this case, you may keep the equipment in use on your facility until it is sold and only have to demo the equipment when a prospective buyer, sent by your broker, is interested. It is the job of the broker to do all the screening, especially financial, so that neither you or the broker find themselves wasting a great deal of time.

The other brokering option is to give a centrally located broker an exclusive on the items you wish to sell and have him demo the equipment in his facility. This will prove advantageous to those persons who no longer have the room for the equipment itself; especially in the case of a major recording console or multitrack recorder. It also give the prospective buyer a chance to play with the gear at his leisure and without taking up your valuable studio time. Surplus equipment also tends to find its way into closets and storerooms. This is particularly true of used gear owned by radio stations. In such cases about the only thing that can be checked at the studio is whether or not the pilot lights work when the unit is plugged in.

Most brokers have established a standard fee for the services they provide. Just as real estate brokers set a fee of about 6% for the sale of homes, an apartment broker 10% of a years rent, etc., equipment brokers generally receive 10% of the final agreed upon sales price from the seller. All brokers do not work exactly the same, yet in most cases, in their consignment way of operating, the broker will consult with the seller before accepting any monies or consumating the sale. This condition of sale insures that both the seller and broker are satisfied with the terms of sale and eliminate any confusion later.

Before the purchase is consumated both the buyer and the seller should have a clear understanding regarding the return of the goods if the buyer is not pleased with it. The buyer, on the other hand, should check the unit as soon as it arrives and allow it to run for an extended length of time. The possibility of return varies considerably depending on the type of unit and the broker involved.

— continued overleaf

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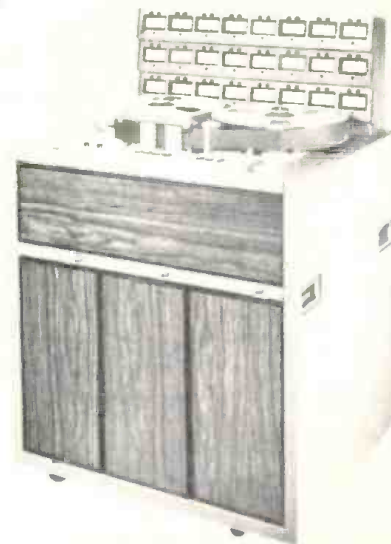
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The purchase of used equipment is more often than not done on a COD or CIA basis; especially with long distance brokerage. This saves the potential problems of nonpayment, having the broker get stuck for the money and the other financial encumbrances possible. The only real exception to the situation is through a leasing company. Some brokers will accept a letter of credit or intent from a leasing company, in lieu of monies in advance and await payment until equipment delivery or installation.

Leasing Used Gear

Most leasing companies do not like to lease a lot of used equipment due to the depreciation factors involved with the equipment itself. This, however, does not mean that you can't lease used gear. Many brokers have affiliations with leasing companies who will lease used gear if the credit situations are all in order. It may take a little convincing, ("I can't pass up this deal," "It's too good," "Look at the value," "It's got a high resale value," etc.). This last option, the resale value, is something that can be used in your favor when attempting to lease

equipment.

A leasing company is in business to lend money and make a profit on that money. They wish the new studio every success, but all they want is to receive their monthly payments on time. One way in which many a deal has been completed is with what is called by "buy-back" option. The broker will discuss your situation with the leasing company and arrive at a rate determined by an agreed upon depreciating time scale in

"The Neumann M-49 and the tube U-47. I like the 47 on most anything. For vocalists I have the singer(s) stand a foot or so back from the capsule."

*Roy Halee
Independent, Hollywood*

the event you default on payments. The buy-back option has closed many deals for brokers and also helped put a lot of otherwise un-buildable studios into operation.

Remember, your broker is there to help you in every way possible and you shouldn't hesitate to ask him for his advice and contacts.

When you decide to either sell or

purchase used equipment from a broker, you should be aware of how brokers identify their inventory.

Brokers list their equipment in different ways, yet I feel that the categories of brokerage sales and listing can be broken down to a few simple yet clear categories. If you know your brokers listing system (which is your advantage as a seller or buyer, and to the broker to let you know), you can place your equipment where you feel that it has the most potential for sale. For example, a sample list of categories of those two key pieces of equipment might consist of the following:

Tape Machines:

Mono, 2-track, 4-track
8-, 16-, 24-track
Hi-fi 1/2-track, 1/4-track,
1/2-size tape machines.

Consoles:

Mixers 4x1 through 24x1
(1567A, MX10, M67, etc.)
PA Mixers (of all sizes)
Broadcast Mixers
Portable Mixers
(for remotes and DC powered)
4 Buss Consoles
8 Buss Consoles
16 and 24 Buss Consoles

These are obviously broad categories, but if the broker represents the items to the seller's best advantage, he very well might and should, include the same item in several categories. For example, if you are selling an Audiotronics 501 console, and you have the 26-in mainframe with only 12 modules, it is only capable of 12 output busses as you have it. But, if you throw in a few more modules, you can end up with instead of a 12-in, 12-out, 12 monitor (12x12x12) console, a 26x16x26 console. The broker should be aware of this and be able to list the console in not only the 8 buss category, but as a potential 16 and 24 track recording board.

The same situation occurs if the broker finds a 3M-56 8-track. Within itself, it may be only a 8-track machine, but if it is pre-wired for 16 track (the limit of the 56 series), it could be entered into both the 8 and 16 track categories. It would be wise in this case, to check either with your broker or the original manufacturer as to whether the parts necessary to complete the update are still available. You should also find out how much the modification will cost and the amount of time needed to do the change-over. It's also a good idea to find out if the work can be done by a non-technical person. Usually the studio that buys used equipment is not only short on cash but also maintenance personnel. Once again the advantage of using a broker is that if he is unable to do the modifications he likely will know who could.

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UREI #920 Cooper Time Cube (1973)

Courtesy of Canyon Recorders

could handle, there could range from the broadest to the finest categorical definitions. An individual broker will have to determine how far to go; especially if he tends to specialize in pro-audio, hi-fi/semi-pro, broadcast or video. These fields are quite distinct in their respective required technical expertise, but any broker should be able to facilitate the sale of any gear if he is properly tooled.

Further brokerage categories might include the following:

- Speakers (with and without baffles).
- Amplifiers (let's only consider pro).
- Cassette and cartridge equipment (including broadcast).
- Equalizers.
- Limiters.
- Noise Reduction.

- Echo Devices (reverb).
- Microphones.
- Signal Processors (DDLs, Flangers, Kepex's, etc.).
- CCTV
- Cameras (color and black and white).
- Video monitors.
- Switchers.
- Dubbers.
- Projectors.
- Miscellaneous.

Miscellaneous is a bad category, but let's call it Direct Boxes, pickups, mike stands, gobos, that "used glass," cables, patchbays, etc.

Price

When you are either buying or selling used gear, how do you know what to charge or pay for your equipment?

This question seems to be one of the most often asked questions by both sellers and buyers when getting into the brokerage marketplace. Every new equipment manufacturer, from consoles to machines, mikes, and so forth, structures a retail price sheet (sometimes called user's net). The only variation from these prices is with each dealer, who may or may not offer his client some discount for any number of reasons. In brokerage there is no clear cut guideline for the market value of a piece of used gear.

There are many more factors to be taken into account than with the purchase of new gear.

Little things such as how tight the fittings are or how many screws are missing is a good indication of how well the unit was treated. Other signs might be stripped threads and parts that appear to not be exact replacements. Smelling the inside of the unit can tell you if the transformers, resistors, or condensers had at one time been destroyed and replaced. Take the time to look inside a unit. How it looks inside is functionally more important than how it cosmetically looks on the outside. If it appears that it's gone through some sort of modifications, if possible find out who made them. Modified equipment isn't something to be frightened of as long as the person or persons making the changes knew what they were doing and had documented in detail every change they made to the original design. Knowing where or how to reach the people who made the changes is important. The history of the manufacturer is equally useful. If the company no longer exists the money you thought you saved will be quickly eaten up when it becomes necessary to fabricate a non-standard part, in this regard electronics aren't as much of a problem as mechanical assemblies. That is with the exception of the elusive and rare VF-14 tube used in vintage U-47s.

QM-8B Professional Mixing Console



FEATURES

- Extremely low noise • High slew rate
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What the Traffic Bears

Ultimately, however, either you as the seller or the buyer, will have to determine what you would like to pay for or sell the gear for. Your guidelines of price anticipation help guide the price market as much as do the other mentioned criteria. If you have owned, say, a set of Dolby 301s since they first came out, but now because you are going 24-track and the 301s may be more cumbersome than necessary, see the need to purchase an M24. You will obviously want to sell the 301s. Since the Dolby's you own are fairly old and they have been paid for for sometime, it may not be that important to you to see absolutely top dollar for them. However, if you are (as most facilities are) tight for dollars, you may need a certain amount of return from the 301s in order to be able to purchase the M24. This will help set your required price and so aid in shaping the price guideline of used gear.

Similarly, if you need a 16-track machine right away, and have cash, a client who wants a certain figure for his machine may settle for something less to make a quick deal and not wait the extra time necessary for him to realize his anticipated dollar return.

The price might also be reduced if the unit does not come with a manual. If the unit is fairly common it's likely the manufacturer will have copies available. On very old units you might have to settle for a Xerox of their one-and-only file copy. In a few cases the reception you get from the manufacturer might be less than enthusiastic. An example would be a smaller company that has changed hands a number of times but the name has stayed the same. In those cases the thing to do is try to find out where the people who built your unit are now working. Another reason might be a company that, when they built your unit, didn't have their game quite as together they do now and would prefer that your old unit quietly go away. By and large, however, most manufacturers are pretty helpful and will give you whatever factory modified improvement were made on later versions of the device.

Used equipment pricing may at first glance seem to be somewhat arbitrary, and so it is to the extent that the industry and its personnel set the standards. But, upon closer examination, you will find that the price discrepancies from place-to-place at any given time are generally not more than 10 to 20%, which is similar in the variations you will see in retail equipment discounts.

The Starting Facts For Buying And Selling

A brief list of the information you should have at your fingertips might include the

following:

- Equipment make and model number all options included; spare parts, etc. When listing the model numbers it should be noted the slight variations in the model during the length of its production life, i.e.: Neuman M-49, M-249, M-249C.

- Age of gear (sometimes an exact age is unavailable, especially in some of the older mikes and outboard gear, but a fair approximation will suffice).

- Condition of the gear. This is a toughy. As an owner, you may not be technically familiar with the gear at all; except that it works. Preferably, however, your technician or free lance maintenance man should speak to the broker and end user prior to a sale. The condition of the equipment will, to a large extent, determine its value.

- Appearance of the equipment.
- Original price of the equipment, if purchased new.
- Serial number of the equipment.

"I've had horn players request the RCA 44 ribbon mike. It gives them the tone they want. It's amazing."

Stan Ross
Gold Star Studios, Hollywood

A comment is needed here about the serial numbers of equipment. Manufacturers have a variety of methods of keeping track of equipment. Some trace the machine history only through the period of valid manufacturers warranty and then forget about it. Some have transferrable warranties which may be good for the life of the gear. Others, and this is to be noted carefully, document serial numbers of equipment which have been stolen from either the original or transferred owner. Stolen microphones are the classic example. Gotham Audio, of New York City, keeps an accurate record on its serial numbers of mikes sold since day one. If a studio or radio station reports that such-and-such microphone was stolen, Gotham will indicate this on its ledger. If the microphone ever comes in for repair, Gotham will hold that microphone and return it to the last legal owner.

So if you are contemplating buying a piece of equipment that you might suspect its origins, check with the manufacturer to determine its status. Most of the time, everything is copcetic, but in that rare instance if there is something amiss, this simple check will save everyone an embarrassing situation. Serial numbers might also be a good guide to the age of a unit as many manufacturers break down the numbers into years.

Additionally

■ Is the equipment still under a manufacturer's warranty and is it transferrable?

■ Will you warrant the equipment yourself as the seller, or as a buyer do you feel you need a warranty (it's best to pre-determine exactly what you are getting)?

■ Who pays for shipping, crating and insurance? (*Always, always ship equipment with adequate insurance. One bad experience with either UPS or any freighting company will make you a believer of this cardinal rule.*) Occasionally the seller will include shipping with the item sold. This is not a rule, so the buyer can generally expect to pay for the shipping himself.

I realize that the above discussion cannot tell you what exactly to charge for your gear or what you should expect to pay, but at least you should be able now to get a fair picture of what goes into the "user net" pricing scale of used gear, and how to go about getting a reasonable estimate of what anything is worth.

Computerized Brokerage

As the used equipment and brokerage business flourishes on its own, without any strict industry guidelines or formula for evaluation and sales methods, there is a most interesting prospect coming to the front of the brokerage scene.

A very enterprising effort is being proposed by Industrial Marketing Advisory Services, of Arlington, Virginia. IMAS, (who also publish Broadcast Equipment Exchange), feel that some of the inherent problems that exist in brokerage today are rectifiable through a centralized inventory system. Steve Dana, the publisher, recognizes the difficulty in either selling or buying equipment quickly.

■ On a monthly listing basis, a client may have to wait longer than he cares for in order to either acquire or dispose of his gear.

■ Monthly publications of used gear are not always up-to-date and many items are not listed on a regular basis.

■ When a client contacts his broker and places his equipment for offer, he is limited in the possible sale outlets because everyone does not use the same broker. Similarly, when attempting to purchase a piece of brokered gear, your broker will only have those listings which have come to him. This limits severely the potential marketplace for exchange.

IMAS proposes a computerized multiple listing service connecting the brokers, distributors and dealers across the United States together into one information network would be beneficial to the industry. It would provide a common pool of listings on available used equipment, and where, or by whom it was located. It would increase the members sales, and allow him to service his customers better. The end user savings add up in a number of ways.

■ He will be able to use the dealer or

broker of his choice, probably someone he has dealt with before and who is reasonably close to his facility.

■ The end user will save dollars in those long distance phone calls which is typical when the brokerage firm is located some distance away.

■ When a piece of equipment has to be checked out by a technician prior to the sale or purchase of the item, a broker can often provide the engineer to perform this service. If, however, there are a number of participating brokers throughout the country, an engineering representative through a local broker may be had, and

substantial savings in travel and expenses can be realized.

■ Finally, and most important, when you want to sell or purchase a piece of gear, it is frequently an "immediately-if-not-sooner" situation. The family of MLS members will increase the marketplace matrix of customers and a savings in either sales or purchase time, usually ends up being a dollar savings as well. This is especially true when dealing with leased or borrowed funds.

All-in-all, computerized brokerage listings and services appear to be a large step in the right direction toward consolidating and standardizing the used equipment market. If

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He said he felt the audio industry—specifically pro audio amplifier design—had reached such a level of technology that everybody had quality specs. Manufacturers were developing "super-specs" for the sole sake of the specs themselves. A new direction was desperately needed.

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His brain began to work overtime. Creative electronics began to take place.

He developed a high-turbulence flow-through ventilation system, direct-mounted power transistors for cooler operation, a unique PowerLimit

circuit, error-free DC and sub-audio protection and functional LED power level indication. He also included a horizontal connector panel with balanced 3-pin XLR-type inputs and outputs. The importance being they all pull together into the first real complete "common sense" amplifier design.

As a result, we at QSC boastfully announce six new models that will set a precedent in amplifier design. We are constantly astounded by the performance, reliability and amazingly faithful reproduction obtainable from these new amplifiers.

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EQUIPMENT with a PAST

the membership of brokers in the IMAS proposal can decide upon a reasonable operating format, the end users in broadcast, recording, video and film can benefit from the arrays of used equipment available as never before.

Now that you know what brokerage is, how it works in various ways and have an approximate gauge for evaluation of your gear, what else is there to know? The kind of used equipment available on a brokerage level and the differences between the assorted gear is what is left.

We are all quite aware of the new consoles, machines, mikes and outboard equipment for sale as evidenced by the proliferation of national advertising. Today, equipment specifications and performance parameters are often published along with the normal sales spiels. We can discuss and argue the different fine points of technical esoterica for all the presently manufactured items. This does not help you, the used equipment purchaser, in evaluating what piece of equipment is right for you; especially when you never have heard of it before.

For example, a client may call a broker and say he is interested in buying a 2-inch, 16-track machine to update his TEAC ½-inch facility. (Which, by the way, is a fairly typical update format.)

The broker, in turn, will ask how much the client is looking to spend for his equipment. Our mythical client will counter with a figure of, let's say, around \$12,000. "Fine," says the broker. "I've got Scully 100s, Ampex MM1000s, MCI JH-10s and a loaded 3M-56."

Unless you're a seasoned professional who has worked with an awful lot of equipment, the broker's response will only seem like a long string of numbers.

"What's the difference?" asks the unknowing client. (Our mythical client is, after all, new to professional multitrack recording.)

The broker, who answers questions of this type daily, begins a long lecture on the differences between the various multitrack machines he mentioned, and generally leaves his client more confused than answered. It's not the broker's fault, because there is a great deal of information needed to cite the differences among not only 16 tracks, but the expanse of available used equipment. Even the years-of-experience engineer cannot know every piece of gear ever made. (No one does, not even the ideal broker.)

Let's continue for a moment with our client-broker conversation, assuming the client hasn't already been so thoroughly discouraged and serial numbered out, that

he decided to go back to potato picking. "Okay," says the client, "I like the sound of the Ampex. What's it called again?"

"The MM1000," responds the broker. "It's a great deal! It comes with a DC Servo and 8-track heads."

Our client might timidly respond, "What's a Servo?" or, as I have often heard, "8-track heads? I thought it was 16 track."

This rather crude example is only attempting to show that both the experienced engineer or recording novice will need a lot of basic information on the equipment he wants to purchase before he is able to make an intelligent decision.

The same situation could apply when someone else calls his broker in hopes of selling a Scully 280 8-track machine, for example. The broker is going to ask a series of questions like:

"Does it have adequate guides?" "Does it have motion sensing?" "Is it de-clicked?" And so forth.

The seller should be as knowledgeable of his gear for sale as should the buyer of the equipment he wants to buy.

As we mentioned earlier, no one knows everything about every piece of gear ever made, including the manufacturers; but it is to the best interest of all concerned to attempt to be as technically fluent in the operation and maintenance requirements as possible of their present or future equipment needs.

"For playback during mastering I have a 30 year old Ampex 200 (Serial#23). We designed new amplifiers for it but the transport is almost the way it came out of the factory."

Doug Sax
Mastering Lab/ Sheffield Records
Hollywood

An Example: A History Of 16 Tracks

So, what about 16 tracks? When did it all begin? And what are the various machines available? I generally attribute the genesis of the multi-track era to the introduction of 16 track machines to the industry. The first attempt at a production version of a 16 track recorder was in 1967 when the engineering staffs of Mirasound Studios, of New York City, and Ampex got together. The combined efforts resulted in an adaptation of the VR-2000 video deck for audio purposes. The VR-2000 was the standard Ampex hi-band color video deck of the day, and was already well capable of handling 2-inch tape. A re-designed tape path, the replacement of video heads with 16-channel audio heads, and the addition of 16 electronics created the AG-1000, predecessor of the infamous MM-1000.

"AG" stood for Audio General, and was

A Gallery of the Greats

(And not so greats)

the prefix used by Ampex for their production machines, including the AG-440 and the AG-350; a solid state update of the 300/350 series machines. Although there was only one AG-1000 ever made, it put in many successful years of recording. The AG-1000, in fact, looked very much like the future MM-1000; it employed the same tape transport and used the 440 series of electronics. But, unlike the electronics overbridge of the MM-1000, all 16 channels were beneath the deck. There was no master sel-sync or master electronics control, (each channel electronics had to be individually selected into either sync or ready) nor did it have many of the modern monitoring conveniences such as tape lifters.

That's right. The first version of the MM-1000 had no tape lifters. The idea behind this was that as 2-inch tape was wound in the fast modes, an air foil of at least a few mils (thousands of an inch) would be created to lift the tape enough off the heads to prevent premature wear. In theory this worked; and it did lift the tape from the heads. It did not, however, lift the tape sufficiently to prevent the terrifying squeal of high speed spooling without tape lifters as we all occasionally hear.

Obviously, the MM-1000 didn't have this problem, but there was still some rewind squeal when the tape was lifted some ½-inch from the playback head. Some studios of the day went one step further, and placed the entire machine into Master Sync when the deck was in either fast forward or rewind. This placed the electronics output from the record head, and the lifters pushed the tape farther from the record head than the playback head, so there was less output rewind squeal.

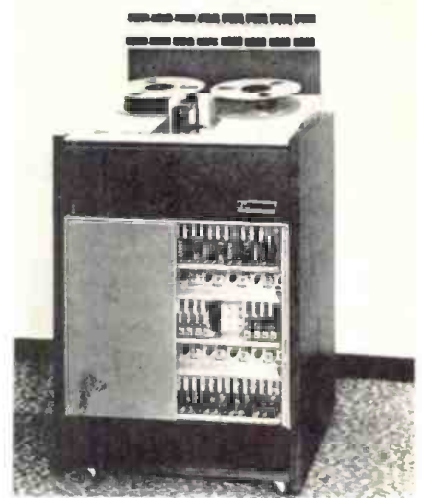
The history of multi-track growth and modification has always been a fascination for me; especially the machines that never quite made it to the marketplace plateau so



**Gauss #1400
Version II**



Scully #100-16



**3M #401
later #56's**

long dominated by Ampex, Studer, 3M and MCI. There have also been a few one-of-a-kind machines, that were workhorses for their creators, but for one reason or another, remained to be unique.

Dimensional Studios, of New York City, a number of years ago, put together their own 2-inch 16 track machines from a collection of Ampex memorabilia. They took a modified 300 top plate, added some guides and a brute force direct drive capstan motor and a

set of 2-inch heads to build the basic transport section. In addition, they electrically locked together 16 channels of vintage tube 351 electronics for the audio. To say the least, this was one of the largest machines around, even dwarfing the MM-1000, and performed quite well until it was removed from service and replaced with more modern gear.

Another New York studio, the former Bell Sound, built in the late 1960s their own

machine, customized from an oversized 300 Ampex top plate. They went for custom milled deck parts, etc., but this machine had a singularly unique feature: it was the only 12 track 2-inch machine around. In fact, in 1968 and 1969, the only machine compatible with it was the MM-1000 24 track at Mirasound where one could paint "between the tracks" to add 12 more tracks to the original 12. The Bell Sound 12 track was later updated to 16 track 2-inch when the industry settled on a

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With your oscilloscope, the Amber 4400A can plot the frequency response of a tape recorder or monitor system; measure the weighted noise of a console; plot the phase response of an equalizer or check the transient behaviour of a speaker; tune your room or measure the RT₆₀ of your studio. Optional interface lets you make hard copy plots with any XY recorder.

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MCI JH-16
JH-5 electronics, JH-10 deck



Ampex MM-1000-16
w/o remote



Studer A-80
MK I

format. The machine is still in use, somewhere, today, since using Scully 280 electronics as the building blocks has prevented its total obsolescence.

The early 1970s brought out a lot of machine innovators to the trade and AES shows, where they could display their creations. XEDIT introduced a machine for 8 and 16 track work which utilized 16 Inovonics electronics coupled to a custom, brute force deck. A good, clean machine, with its own uniqueness in audio annals: It had an internal 16 channel premixer, which would permit the machine to be used with a full scale recording console for overdubs or small tracking requirements.

Custom Fidelity demonstrated their Pro-Master 16 2-inch machine, which available in a 24 track format as well. The DC servo controlled dual capstan system was an adaptation of 3M's Isoloop, and was one of the first machines to have electronic features including built-in tape timer with automatic return to '0,' and internal varispeed with ips readout. This machine, as the original AG-1000, had no tape lifters, but still avoided close tape-to-head contact.

In the growing multitrack fever, a major tape duplication manufacturer attempted to enter the machine market. Gauss Electrophysics, in 1969, introduced a very advanced and unique 8 and 16 channel

recorder. The Model #1400 used an indirect drive PLL controlled DC servo with dual capstan drive. Computer based logic systems controlled the full FET switched electronics and provided automatic monitoring switchover and transport readout. The bias circuits were very reminiscent of the duplication heritage of the manufacturer: a beamed RF bias field was generated and ran at around 2 megahertz.

Other manufacturers developed prototype machines which never hit the market or had a very limited issue. (Remember the first couple of MM-1100 demonstrations?) Since, however, we are discussing the likely used equipment to be found on the streets, we

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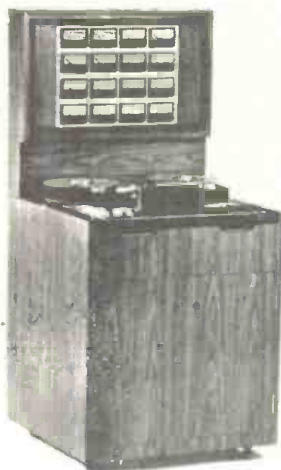
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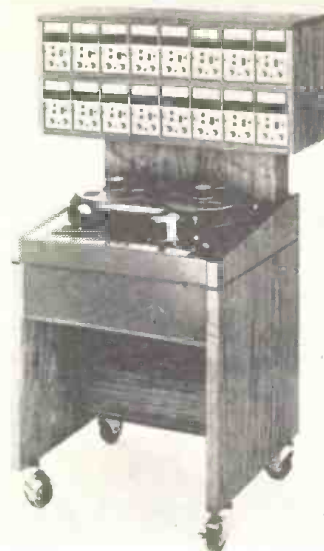
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Ampex MM-1100-16
w/o remote



Auto Tec L-16



Gauss #1400
Version I

have compiled the following chart to be used as a reference by the buyer who may have limited knowledge of the machines of yore. Obviously, not every detail of every machine made could be noted, but we have attempted to outline the basic distinctions between the various equipment, and include a little trivia about each one. Even within each category there may be wide variances from what we have itemized to what you might actually find in studios for a number of reasons.

■ When manufacturers introduce a new machine, there are often several transition machines where new ideas are tried out, and bugs worked out.

■ Often, manufacturers will make a quasi-custom machine to meet individual customer requirements. This is especially true with machines found in the video and film industries where wide band circuits for SMPTE and extensive interlocking provisions have been used.

■ Some earlier machines may have been updated to meet the newer machine specs or operational features.

■ Customers often modify machines themselves for their own needs, or the studio's client's requirements. All customer mods put into a machine, should have as much documentation as possible to prevent the buyer from having future headaches.

"New doesn't necessarily mean better. There's a lot of old equipment that probably sounds better than the new gear. And making something smaller doesn't necessarily mean that the device has been improved."

Armin Steiner
Sound Labs, Hollywood

One further point might be made to the used machine buyer. Get, from the seller, as many spare parts as you can; include those extender cards, bearings, light bulbs, switches and, of course, paperwork on the machine. The extra few dollars you may be charged will be well spent the first time your new-used machine goes down. □ □ □

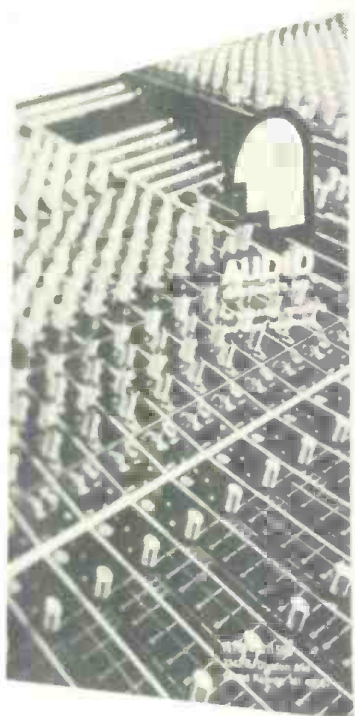


The Symetrix CL-100 represents a major step forward in versatility and cost-effectiveness.

Consider these features: D-essing, Independent attack and release controls, Side chain insertion which allows an equalizer to be patched into the control loop for frequency dependent threshold, and LED gain reduction and threshold indication. CL-100: \$299, CL-100B (Balanced): \$349.

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STUDER A800 PROFESSIONAL MULTICHANNEL MAGNETIC TAPE RECORDER

The Studer A800 features an entire new-design concept, with outstanding mechanical stability, 14" reel capacity, high user flexibility, ease of operation and very fast responding transport; diecast chassis with extremely rugged, stainless steel headblock, and DC spooling motors with very high torque, featuring fast reaction times and high winding speed. Reaction time and reel capacity match a modern VTR. This concept is ideal for operation with the Studer Tape Lock System 2000 or any Video-Audio, Film-Audio or Audio-Audio synchronization application.

Greatest flexibility of the A800 concept is obtained by using a Microprocessor. The hard wired transport control has been eliminated and replaced by a new flexible and "intelligent" logic. With the functional parameters defined by software only, entirely new dimensions are opening up.

The microprocessor is the "brain" of the control system. All transport and electronic units are controlled via several bus systems. It generates reference voltages and frequencies and drives all status indicators and displays as well. A special rack on the backside contains the "delay unit." Here, the microprocessor controls the exact timing of erase head and record head switching, thus permitting gap-free electronic editing.

This rack also contains the optional Tape Lock Interface. In connection with the Tape Lock System 2000 a fully automated and

high precision electronic editing with perfect editing simulation facilities becomes possible.

In the audio electronics great technical advantages have been achieved, too. High impedance matching of head, excellent signal-to-noise ratio, treble control in the record amplifiers and bass control in the reproduce amplifiers are phase corrected for best transient and linear phase response. Two Line-Outputs are available providing Input, Sync, or Reproduce. Fast Record alignment with "Master Bias Control." NAB/CCIR equalization is electronically selected with a master switch.

The audio channels can be controlled altogether with master switches or individually. Very interesting features are also Mute, Rehearsal (simulation of an electronic edit), Drop in/delay inhibit, Auto input (switchover to input when tape stopped), Spot Erase, Standard equipment also includes built-in digital timer, zero locator, address locator and variable speed control.

A channel audio remote control box is available as well as a sophisticated autolocator offering 20 memories.

STUDER REVOX AMERICA, INC.
1819 BROADWAY
NASHVILLE, TN 37203
(615) 329-9576

for additional information circle no. 69

dbx INTRODUCES EIGHT-TRACK PRO-FORMAT NOISE REDUCTION

dbx, Incorporated, manufacturers of signal processing equipment for the professional and consumer markets, has added a new professional-format 8 track tape noise reduction system to its product line. The system's nationally advertised value of \$1,100.00 places pro-type noise reduction within economic reach of most small studios or semi-pro recordists. The new Model RM-155 is available for immediate delivery.

The Model RM-155 professional format tape noise reduction system consists of two dbx 155 four-channel units in a 3 $\frac{3}{4}$ " rack mount package to provide eight channels of switchable noise reduction or four channels of simultaneous (encode and decode) functions.

Like other dbx professional systems, the RM-155 eliminates audible tape hiss by providing 30 dB broadband noise reduction at all levels plus a 10 dB increase in recorder headroom.

The RM-155 is a mirror-image compressor/expander — halving the music's dynamic range at the input (compression),

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If you have been to places such as: the GRAMMY DISCO PARTY, SPECTRA SOUND STUDIOS, or the CONCORD PAVILION (all tops in their field) you already know why such comments are being generated. However, most comments about the SPECTRA SONICS Model 701 Power Amplifier are unbelievable . . . until you've heard it!

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As a result of MASTER-ROOM, "NATURAL" is now the key word in reverberation equipment, but a word that is too often used without regard to its true meaning.

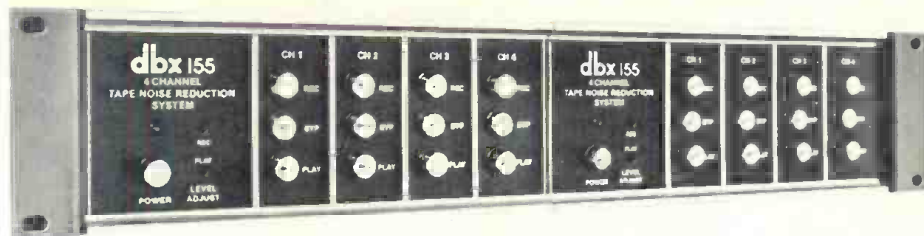
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R-e/p 114



then providing an exact complimentary expansion by a ratio of 1:2 at the output.

In playback, the RM-155 completely restores the music's dynamic range so it is indistinguishable from the original, without audible tape noise added by the tape recording process.

The dbx tape noise reduction circuitry is a true RMS detection/voltage controlled amplification system, insuring proper encode/decode tracking, and accurate transient response without the need of pilot tones or critical level matching adjustments.

All eight channels on the pair of 155s in the RM-155 are independently switchable from the front panels to record (encode), bypass, or play (decode) functions, permitting either eight channel switchable or four channel simultaneous operation. Record and play level adjustments have front panel access. Each 155 also has user-changeable modular circuit boards for each channel. (Spares are available at extra cost.) Installation is simplified with all inputs terminating in phono connectors.

The dbx RM-155 eight channel tape noise reduction system is fully compatible with dbx models 152, 154, 157, 158, 177, 187 and 216, as well as TEAC/Tascam DX-4, DX-8, and other on-board dbx pro-format tape noise systems.

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The Orban 672A Equalizer is an 8-band, single channel, parametric equalizer with the convenience of graphic-style EQ controls. EQ sections are reciprocal and have a ± 16 dB range.

Also included are independent high- and low-pass filters which can be used to bandlimit in the usual way or, by means of

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Special 'tic' markings allow the user to set the controls to simulate a familiar 8-band graphic equalizer. A "peak-stretching" overload lamp warns of clipping anywhere in the unit.

Its design, packaging and specifications meet full professional requirements.

ORBAN ASSOCIATES, INC.
645 BRYANT STREET
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for additional information circle no. 73

YAMAHA PM-2000
MIXING CONSOLE

The Yamaha PM-2000 bridges the gap between large, full-featured custom-built consoles and smaller, stock mixing boards. It is a highly versatile total mixing system suitable for sound reinforcement, theatrical production, broadcast production, and recording. Conceived in the tradition of the proven PM-1000, the PM-2000 is based on over four years of research and development in cooperation with leading professional sound engineers and mixers. The console incorporates new circuits plus a host of input/output, switching and patching facilities. All with field-proven Yamaha reliability. Below are summarized just a few of the console's many features:

Twenty-four or 32 input channel mainframes are available, each having 14 mixing buses: 8 program, 4 foldback, and 2 echo. These may be used for sub-grouping, scene presets, multi-channel recording; remote feeds, effects sends, interruptible foldback, stage monitoring, etc.

A unique mixing matrix permits the 14 buses to be mixed down into 8 different outputs. (The bus outputs are also available directly.) The matrix is ideal for deriving various mono or stereo mixes from the bus sub-groups to feed different speaker



Studio quality microphones that don't need a studio to survive.

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microphone is equally at home in a recording environment or broadcast studio. When hand-held it puts sex appeal in a voice with its bass-boosting proximity effect. With shaped high-frequency response and its ability to handle high sound pressure levels (140dB with 1% THD at 1kHz), the CS15P is ideal for close-up vocal or solo instrument miking applications.

When boom mounted, the CS15P has better gain-before-feedback and a better signal-to-noise ratio than most shot-guns. It's phantom powered and it's rugged.

The CO15P condenser omni extends frequency response to the very limits of audibility, 20 to 20,000 Hz. Unlike other "omni's," the CO15P maintains its omnidirectional polar pattern at the very highest frequencies.

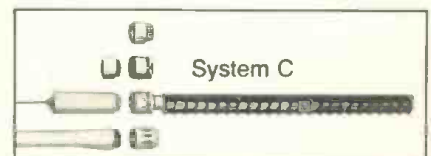
Perfect for the distant miking of an entire orchestra as well as up close on individual instruments. And like the CS15P, it's phantom powered and it's rugged.

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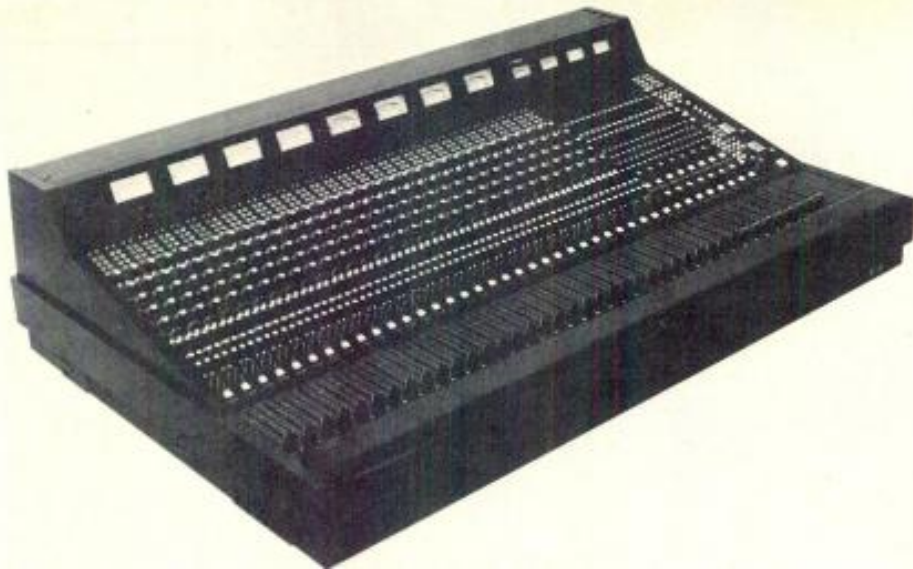
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R-e/p 115



systems (front fill/main/back fill/lobby/etc.), for deriving mix-minus IFB feeds in broadcast production, for boom mike monitoring, performer's headphone (cue) mixing, studio and CR monitor mixes, remote feeds, and more.

The console is shielded and bypassed to exclude radio frequency interference (RFI). All inputs and outputs are balanced or floating, transformer-isolated XLR connectors, with the exception of the interstage insert points, which are tip/ring/sleeve phone jacks. Maximum output level is +24 dBm @ 600 ohms.

Interstage insert (patch) points on each input channel (post-EQ/pre-fader) and on program output buses are ideal for insertion of auxiliary equipment such as compressors and graphic equalizers; these same TRS jacks are also ideal for use as direct outputs to other consoles, to tape machines, to effects units, and so forth.

Smooth, conductive plastic faders have accurate dB calibrated scales. The channel input attenuators simultaneously change mike preamplifier gain and pre-transformer padding to preserve maximum fader control with full headroom and minimum noise, regardless of input source. There is also an LED channel overload indicator on each input.

A phantom power switch on each input channel (and a master phantom power switch) aid use with remote-powered condenser mikes. Handy phase reversal switches are also provided.

Channel, submaster and matrix on/off buttons aid fast punch-ins and punch-outs, and are illuminated for fast visual status indication.

Equalizers have four knobs that yield 15 dB boost or cut (peaking and shelving curves) at 20 frequencies (overlapping ranges). There are in/out buttons, and center detents at "flat" position. There is also a switchable high pass filter (off/40/80

Hz) on each input.

A foldback pre-post switch for each pair of send knobs provides a choice of deriving signal before or after the EQ and fader; an echo pre-post switch for each echo send knob selects signal before or after the fader (these takeoff points are easy to rearrange).

The two echo/effects return channels each have 14 bus assign switches, cue assign, and a master level control. The effects returns can be used for an assignable, stereo line level input channel.

Pan pots have the standard sine-cosine characteristic, plus pan in/out buttons; they assign the panned signal to off or even numbered program buses when the corresponding pan switch is in.

There are complete headphone cue facilities, a built-in talkback system with microphone and line inputs (compatible with three wire intercoms), and a combination test-calibration oscillator/noise generator.

All VU meters are illuminated (and easily re-lamped) and have built-in peak indicating LEDs. The 8 larger VU meters are switchable for program out or mix matrix output level monitoring, while the 4 smaller meters are switchable for echo, foldback and cue level monitoring.

Three rear panel switches enable the console's overall gain to be increased by 10 dB for any of three major signal paths (program, monitor, echo/effects). This optimizes signal-to-noise performance and master fader position for average to high level inputs, yet provides the sensitivity need for distant, low-level mikes.

A remote, 19" rack mount power supply yields minimum hum, maximum reliability, and minimum down-time in the event of difficulty.

The sound quality and specifications are top rate — low noise (-91.1 dBm output noise), wide headroom (over 20 dB throughout), wide frequency response (20

kHz bandwidth), and low distortion (IM and THD virtually unmeasurable).

Complete functional information, specifications, a block diagram, headroom diagram, and suggested applications are detailed in the PM-2000 catalog, available on request.

**YAMAHA INTERNATIONAL CORP.
MUSICAL INSTRUMENT DIVISION
P. O. BOX 6600
BUENA PARK, CA 90622**

for additional information circle no. 75

TEAC/TASCAM NEW VSK-88 VARIABLE SPEED CONTROL

TEAC/Tascam Series is introducing the VSK-88 variable speed control which can be used with Tascam 40-4 and 80-8 recorder-reproducers to change either speed or pitch.

According to Bill Mohrhoff, Tascam national sales manager, the unit, which carries a suggested retail of \$350.00, is available for immediate nationwide delivery. Installation of the VSK-88 can be done at authorized Tascam service centers at no additional charge, Mohrhoff said.

He said the variable speed control provides the recordist with a single-speed servo-controlled DC motor. "So, in effect, the recordist gets a brand new capstan motor for his 80-8 or 40-4, which automatically upgrades his equipment and expands its use," Mohrhoff pointed out. The unit adjusts speed at 15 ips either plus or minus 20 per cent. In musical terms, the VSK-88 also adjusts pitch a tone-and-a-half, from A up to C, or from A down to F#.



The VSK-88 can be used as production aid to reduce over-long tapes to the proper time limit. And the controller has ideal applications in cueing and timing audio-video soundtracks, and slide or filmstrip audio tracks.

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OF AMERICA
7733 TELEGRAPH ROAD
MONTEBELLO, CA 90640
(213) 726-0303**

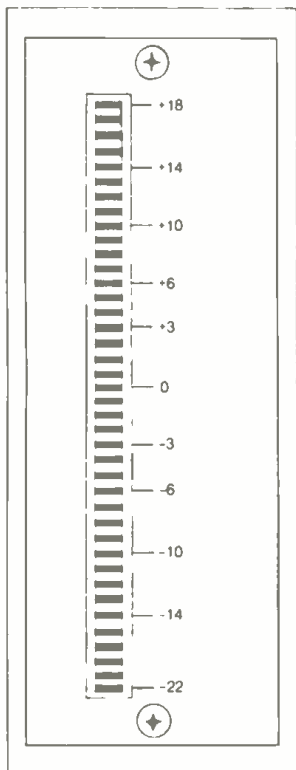
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YOU SAW IT IN R-E/P

Coming Soon to the Sound Workshop Series 1600...

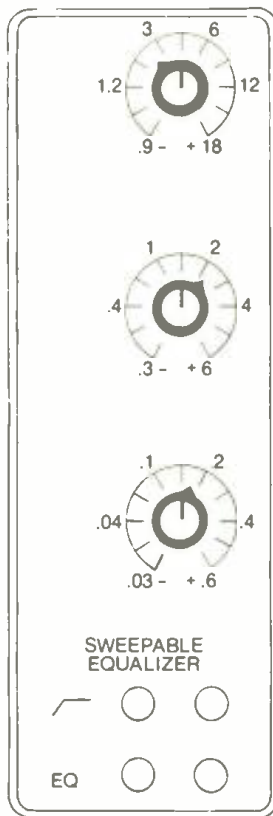
New Options.

High Resolution Metering



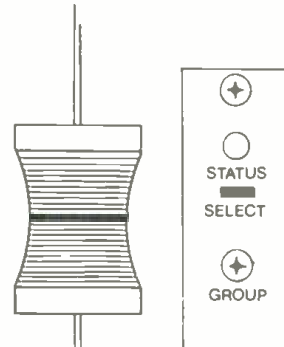
The Sound Workshop Series 1600 is now offered with a High Resolution Meter/Output Module. The 40 segment light bar meter features a 40dB dynamic range, built in spectrum analyzer, and peak, average, and peak/hold modes. (The standard LED column meter is now available with peak reading capability and the Series 1600 can also be fitted with standard mechanical VU meters.)

New Sweepable EQ

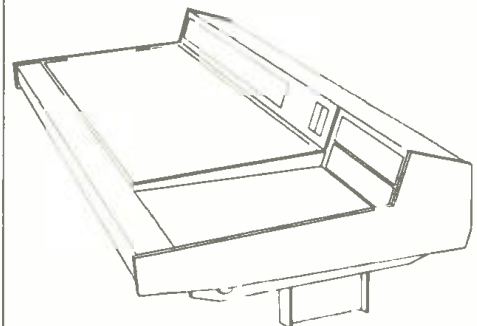


In addition to the standard 15 frequency equalizer and the full parametric EQ, a new sweepable equalizer is available for the 1600. Functionally it is identical to the parametric EQ without variable "Q." Three bands are offered, each with a 20:1 frequency range, and a boost/cut capability of 14dB. As with all Sound Workshop equalizers, the new sweepable EQ is fully stable in all parameters and is totally musical in its action.

Super Group



Planned as an option for ARMS Automation is Super-Group; a unique, user oriented grouping system, which provides input subgrouping, limited only by the number of inputs in the console. Super-Group allows instant visual indication of group assignment and status and can be retro-fitted into existing ARMS Automation systems.



**The Series 1600
Recording Console.**

BRINGING THE TECHNOLOGY WITHIN EVERYONE'S REACH.
CH. Sound Workshop

Sound Workshop Professional Audio Products, Inc.
1324 Motor Parkway, Hauppauge, New York 11787 (516) 582-6210

for additional information circle no. 77

www.americanradiohistory.com

R-e/p 117



**DELTA LAB DL-3
DIGITAL DELAY LINE**

Designed for applications where only one delay is required, but sonic accuracy is important, the DL-3 sets new standards in price/performance for digital delay.

The DL-3 features: 20 - 15 kHz bandwidth at all delay lengths; THD plus noise of less than 0.2%; Dynamic range 90 dB or better; One input/one output; Delays from 0 to 120 ms; and built-in bypass.

The DL-3 is recommended for under balcony areas in small theaters, auditoriums, etc. In live performance, the DL-3 can be used to increase stage presence. Uses in the studio include Haas-effect image localization, doubling and pre-reverb delay.

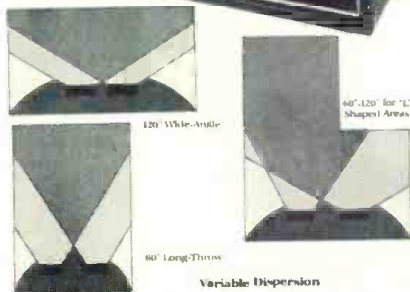
Suggested retail price is \$775.

**DELTA LAB RESEARCH, INC.
27 INDUSTRIAL AVENUE
CHELMSFORD, MA 01824
(617) 256-9034**

for additional information circle no. 78

**NEW SHURE 701 SPEAKER
COMPUTER DESIGNED**

Shure Brothers, Inc., Evanston, Illinois, has announced a new, variable dispersion loudspeaker system that is computer-



designed to yield big speaker performance in a compact, lightweight, and easy-to-handle package. According to Shure, this is the only loudspeaker on the market with the variable dispersion feature.

Called the Model 701 Pro Master Speaker System, each speaker consists of a 15-inch woofer in a front-ported bass reflex cabinet and a high frequency horn and driver combination. Power handling capacity is 150 watts of continuous program material. The 8-ohm speaker systems produce 100.5 dB SPL (sound pressure level) at 1.2 m (4 feet) with only a 1-watt input.

A unique feature of the system's horn is a variable dispersion control. Operation involves simply turning a knob located in the mouth of the horn to 60° or 120° settings. The 60° setting is used where narrow, "long-throw" coverage is desired, and the 120° position for wide-area coverage in "short-throw" applications. This feature allows adapting the speaker quickly and easily to any size or shape room.

The highlight of the Model 701 is its compact, lightweight design which produces an easy-to-handle package. Overall dimensions of the system enclosure are 702 mm H x 584 mm W x 402 mm D (27-5/8" x 23" x 15-13/16"). With such a small packaging and weighing only 26.4 kg (58 lbs.) each, Model 701 speakers can be easily moved from setup to setup without special dollies or vehicles.

User net price for each Model 701 speaker is \$495.00.

**SHURE BROTHERS, INC.
222 HARTREY AVENUE
EVANSTON, IL 60204
(312) 679-4020**

for additional information circle no. 79

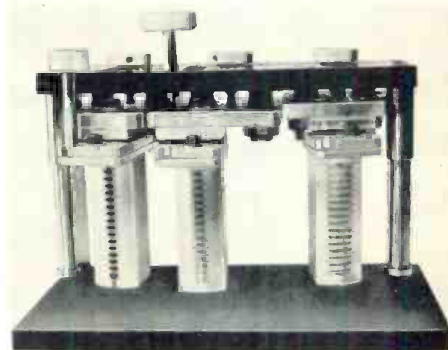
**PROMIX I: MULTITRACK HEAD
MOUNTING ASSEMBLY FROM
GRANDY**

The Promix I, professional studio multitrack head mounting assembly, offers a totally new dimension in high quality recording standards. By extending the precision manufacturing tolerances normally found in magnetic heads to the mounting assembly and providing adjustments for added versatility, the user has complete control over all aspects of head alignment.

This means that azimuth, zenith, tape wrap and track height (placement) are independently adjusted by means of a linear

type control. All other adjustments (including track height) will not be affected.

As a result, high frequency and peak adjustments which are normally difficult and time consuming with conventional assemblies are smooth, simple and repeatable with the Promix I. The Promix I also features a head subplate which enables individual head removal for relapping, configuration changing or replacement without seriously affecting alignment.



Completely user oriented and human engineered, the Promix I is designed to reduce alignment time, fatigue and offer ease in head maintenance. It is designed to fit many studio recorders currently in use in addition to custom applications. Also available is Grandy's complete line of multitrack magnetic heads.

GRANDY, INC.

**1275 BLOOMFIELD AVENUE
FAIRFIELD, NJ 07006
(201) 575-1433**

for additional information circle no. 80

**SOUNDER ELECTRONICS
PHASE CHECKER**

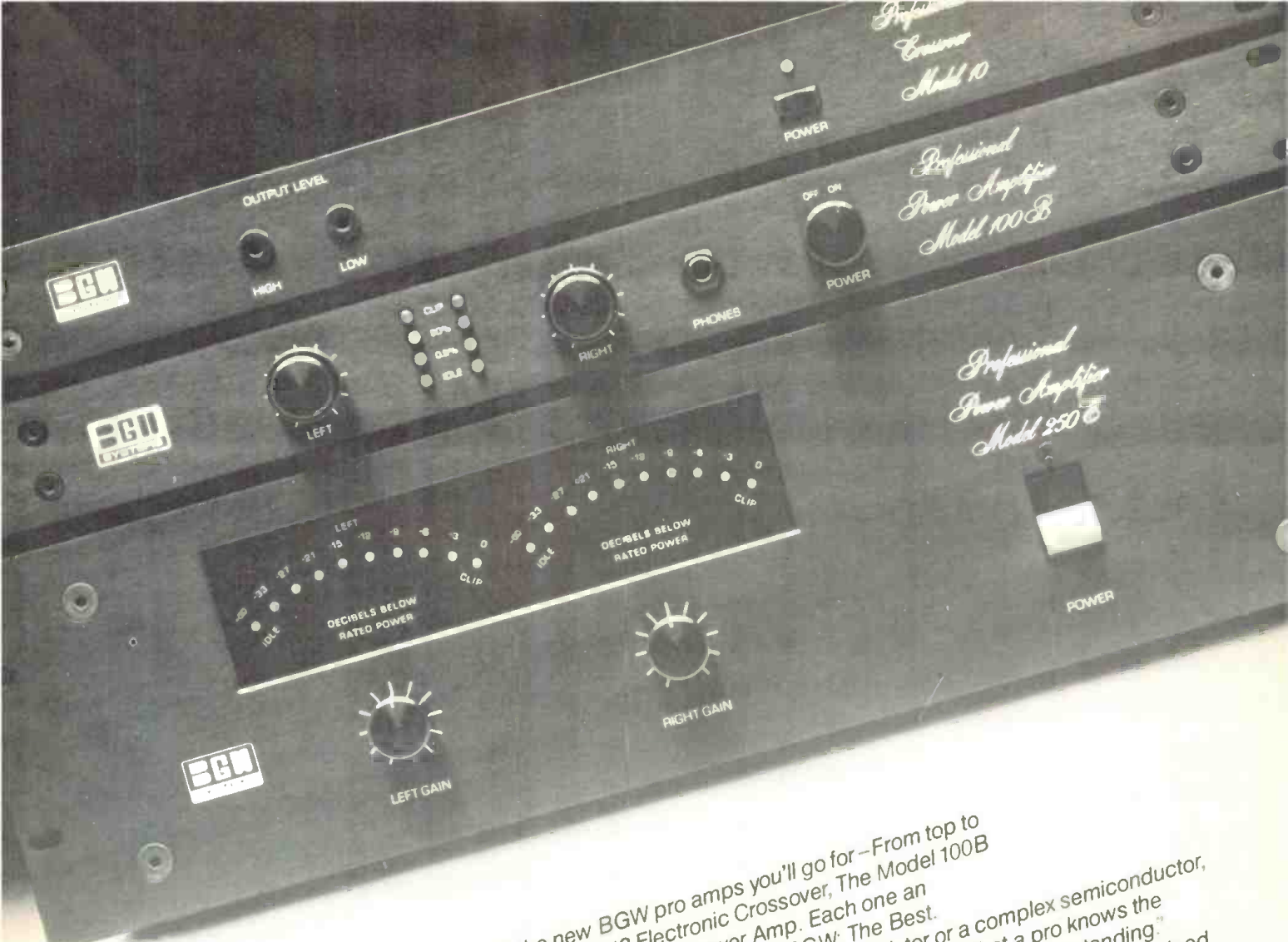
Sounder Electronics has recently developed an important new audio testing instrument called the "Phase Checker," for determining the phase polarity of all acoustic transducers (woofers, tweeters, horns, drivers, microphones, as well as cables, amplifiers, crossovers) and all other audio equipment.



Previous models of the Phase Checker have been used by the Jefferson Starship, American Zoetrope, Hot Tuna, Star Fine Sound.

**SOUNDER ELECTRONICS, INC.
21 MADRONA STREET
MILL VALLEY, CA 94941
(415) 383-5811**

for additional information circle no. 81



Professionals Swear by Them, Competitors, at Them.

They're the new BGW pro amps you'll go for - From top to bottom, The Model 10 Electronic Crossover, The Model 100B Power Amp, and the 250E Power Amp. Each one an extension of our basic philosophy at BGW; The Best.

Whether its a simple resistor or a complex semiconductor, BGW is dedicated to the principle that a pro knows the difference between "good enough" and "outstanding." Because we know that quality in a pro product is indeed something you can see, touch and hear, everything that goes into a BGW product, every gear to designed to back up the man who depends on our gear to make his living. And, like all BGW products, the new 250E with our exclusive arc-scale power indicators joins with the new 100B and Model 10 in answer to your demands. They're worthy additions to the solid-gold reputation that's been earned in recording studios, discos and concert stages throughout the world.

If you're not already a BGW Pro we invite you to compare any of our products with anybody else's. Anybody's. You'll then see why so many of your pro friends swear by us. And our competitors, at us.

Go For The Best



BGW Systems, Inc.
13130 South Yukon Avenue,
Hawthorne, California 90250
In Canada: Omnimedia Corp.,
9653 Cote de Liesse
Dorval, Quebec H9P 1A3



AUDIO & DESIGN EX-PRESS LIMITER

The stereo Ex-press Limiter is a superb, compact compressor-limiter-expander, designed with simplicity of operation in mind.

Function mode is controlled by digital logic momentary switches with no audio path contact to wear out. A memory system retains 'last use' settings when switched off, with a series of LED indicators to show the status of functions when the unit is powered.

The Ex-press has stereo input/output attenuators, variable attack and release times and an auto release network. Ratios provided are 1.5:1, 2:1, 5:1, and limit (20:1) turning into a limit slope after 10 dB of compression to ensure smooth overload protection. The softer ratios combine minimum dynamic change with subtle compression, whilst the tighter slopes, with fast release, are useful for punchy effects.

It is only necessary to initially set output level under limiting conditions, select ratio required and adjust input to provide compression, switching in expander if necessary. The compressor side-chain can be RMS or peak sensing; a PC board mounted switch can select preemphasis in the limiter side-chain.

The 1:2 Expander function comes with 'range' factory pre-set on the PC board (10 dB) and there is a choice of three threshold settings.

A unique dual-calibrated meter with both VU and Gain Reduction scales monitors output level (left, right, sum) or Gain Reduction and LEDs indicate limiter, compressor and expander operation.

The unit is expected to be available beginning in August/September, 1979.

AUDIO & DESIGN RECORDING
84 OXFORD ROAD
READING, BERKS., U.K.
TELEPHONE: (0734) 53411

for additional information circle no. 83

ADD-1: NEW DISC PREVIEW STANDARD

An audio digital delay system that provides the highest quality signal output during the final disc mastering step has been introduced by Ampex.

The Ampex ADD-1 audio digital delay was demonstrated during the recent AES, in Los Angeles, as part of the Ampex mastering system: An Ampex ATR-100 audio recorder with the new 1/2-inch, two track head assembly, Ampex Grand

Master™ studio mastering tape, and the ADD-1.

"The Add-1 is a total electronic solution to disc preview operations that preserves the original audio quality while saving valuable set-up time by production talent," says Lee Cochran, general manager of the Ampex audio products group.

Add-1 provides a delay of 16-bit digital on balanced-line analog input signals with 90 dB dynamic range to produce a "truly transparent digital answer to disc previewing at analog prices," adds Cochran.

"When used as part of the Ampex mastering system, the recording professional has the capability of bringing 80 dB performance to the lathe."

Add-1 offers standard features that eliminate changing tape speed and rethreading problems. The same setting can be used for any tape speed, and the push of a button on the LED control panel changes delay times. Delay times can be pre-set in addition to selectable delay times in 5 ms increments.



The system requires only two channels of audio, and eliminates the need for a special preview machine, and the system is totally compatible with normal and half-speed cutting.

The system can be used to preview direct-to-disk or digital recordings; features transformerless input/outputs, with both serial and parallel multiplexed digital input and output ports.

In addition to its standard features, Add-1 has an optional 100 kHz sampling rate with 2.56 second maximum delay to provide a wider-than-normal system frequency

response.

Installation flexibility is enhanced with a stand-alone cabinet for the system, which is normally rack mounted.

AMPEX CORPORATION
401 BROADWAY
REDWOOD CITY, CA 94063
(415) 367-4151

for additional information circle no. 84

NEW MODEL H949 EVENTIDE HARMONIZER

At the recent AES Convention, in Los Angeles, Eventide Clockworks introduced their new Harmonizer, Model H949. The unit can change the pitch of an input signal by three octaves (one up, two down), has two outputs, each with 400 milliseconds of delay, a frequency response of 15 kHz, and a signal-to-noise ratio of 96 dB.

As well as pitch change and delay, the H949 has a variety of capabilities, including flanging, repeat, random delay (for automatic double-tracking), and an entirely new effect — reverse. The micro pitch change function allows extremely precise, stable settings, ideal for tuning in a later addition to a mix, or for adding 'body' to a vocal or instrumental sound. There is also high and low equalization of feedback.

The H949 Harmonizer has two different algorithms to handle the pitch change 'glitches,' so the user can select whichever is optimum for the program material. Algorithm #2 provides, with the possible disadvantage of some 'coloration' of the sound, a glitch-free method of changing pitch by small ratios. Using this algorithm allows modest shifts (roughly between ratios of 0.9 and 1.1), with absolutely no hard glitches under any circumstances, regardless of the type of program material.

A four-digit pitch ratio readout, red/green LEDs for function select, and an input level indicator showing present/normal/limit status help to make the H949 Harmonizer simple to operate. Delay is selected by incremental pushbuttons; pitch change is controlled either by a knob (manual mode) or by the HK940 keyboard, which varies the pitch in discrete manual steps. Rear panel connectors are XLR type, with tag strip for external control and capstan drives (the unit can be used to control the speed of a tape machine). The H949 is switchable for 115 or 230 volts, and takes 8.89 cm (3 1/2") of rack space.



Time for a change? ... MAINLINE™



IT HAD TO HAPPEN...

We're all too aware of the vast amount of audio cable used on stage and in studios today. The cost of wire connectors and assembly time is astounding! Now, imagine if you could reduce your cost and trouble by eight times, while dramatically improving your sound in the process. Fantasy? We think not. The recent introduction of the incredible MAINLINE by J H D Audio is a reality! It is perhaps the most significant advance in audio technology of this decade.

WHAT IT IS...

The MAINLINE will encode and combine eight signals and transmit them up to 600 ft. using only one standard microphone cable. It will then decode each one for mixing resulting in eight separate signals. MAINLINE has no gain loss (it actually increases gain). It will reject CB and RF interference. Above all, it improves microphone performance by expanding dynamic range, extending frequency response, and drastically reducing hum and noise.

HOW IT WORKS...

MAINLINE employs analog and digital technology to create a unique "time domain multiplexing system" specifically designed for high quality audio reproduction. The system contains two modules connected by a standard microphone cable. The eight channel input module is located on stage. This stage module encodes and transmits data to the output module (at the console) which decodes the signals and feeds the mixer. There are three different MAINLINE encoder designs. One for balanced lo impedance microphones; one for hi impedance instruments; another for mixer output signals. The decoder module has output levels that accommodate all mixers and/or amplifiers. The MAINLINE comes standard with a 100 foot cable. It is calibrated to operate with cable lengths of 25 to 600 feet without sacrificing performance (MAINLINE could be adapted to perform at any distance).

WHAT IT ALL MEANS...

... It means you can send all the guitars and keyboards from the stage to the mixer on one line of your existing microphone snake. MAINLINE eliminates costly balancing transformers and tons of additional cable. You save money, time, and hassle. It's simpler, more reliable, and most important, the music sounds much better!

... It means simple, quick system expansion for club, church or studio without costly new cable installation. Each existing built-in microphone cable can now carry either eight microphones or eight instruments.

... It means an engineer can now run a stereo tri-amp sound system with the cross-overs located at the mixer allowing balance control during performance. The six separate line sends can be carried by any one channel of a microphone snake, with two sends to spare!

... It means live 24 track direct stage recording on three standard microphone cables offering dynamics and audio fidelity never before possible outside the studio. In addition, you can set-up and record from virtually any remote location.

... It means a keyboard player can do his own mix on stage and send his keyboards direct for a separate main mix.

... It means the often unreliable hand-soldered connections are reduced 90%.

... It means the wire required in a conventional 16 channel, 100 ft. cabling system will be reduced from 3,300 to 600 feet. This saves money, time and weight. More important, without 2,700 feet of excess wire weighting down the signal, your music emerges with its dynamic character intact. And that's what live music is all about!

DOWN THE LINE...

All this is possible right now. Imagine, however, what this breakthrough means for the future! MAINLINE sets new standards for audio performance (live or in studio). It has eliminated one of the most common deterrents to audio excellence... loss of signal quality due to too much cable.

MAINLINE also eliminates the need for massive quantities of transformers and 3-pin connectors... greatly reduces set-up time... requires no maintenance... could cut the cost of a typical 16 channel system by 40% while improving reliability, flexibility and sound quality.

Perhaps MAINLINE's only drawback is that it took so long to get here!



MAINLINE... is a Trade Mark of J H D Audio

WHERE TO BUY IT...

With the exception of a few select audio dealers and commercial sound contractors, MAINLINE hasn't been available to the public. General distribution is 12 to 18 months away.

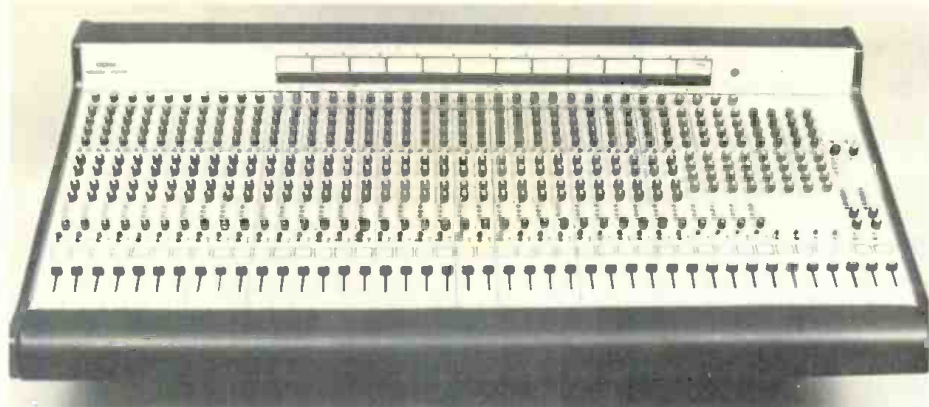
ASPEN & ASSOCIATES was conceived after years of experience in music, to introduce new technology and innovative products to the performing music community. We're sure you will agree that MAINLINE falls into this category. So we have secured a supply of MAINLINE's from J H D Audio and will be offering them for sale starting July 1st, 1979.

All three systems are eight channel expander models designed for either direct instrument sends, balanced lo impedance sends, or line level mixer returns. Each MAINLINE includes an encoder module, a decoder module, a 100 ft. connecting cable, and eight output patch cords. The price? \$500 for an instrument send or mixer return system... \$550 for the balanced lo impedance system.

ASPEN & ASSOCIATES guarantees each MAINLINE we sell. If not completely satisfied with its performance, we'll refund the purchase price plus shipping. To order MAINLINE, just call ASPEN & ASSOCIATES, Monday thru Friday, 9 AM to 4 PM (PST).



ASPEN & ASSOCIATES 362-1551
13994 SIMSHAW AVENUE · SYLMAR · CA 91342 · NINE TO FOUR (PST)



Delivery of the Model H949 Harmonizer will commence September 1, 1979. Eventide will continue to produce the Model H910 Harmonizer. (Note: The HK940 keyboard can be used with either unit.) The price of the H949 is \$2,400.00.

EVENTIDE CLOCKWORKS, INC.
 265 WEST 54TH STREET
 NEW YORK, NY 10019
 (212) 581-9290

for additional information circle no. 86

**TOUGH NEW ROAD
 CONSOLE FROM APSI**

Audio Processing Systems, Inc., (APSI) has announced immediate production availability of their sound reinforcement

console, the Model 2000 mixing console.

The Model 2000 is unique in that it has been built to withstand the rough handling of a road operation while retaining all the sensitivity, flexibility and ease of operation of the most sophisticated studio units.

All necessary functions are incorporated in the standard APSI console. As many as 32 input channels feed four sub-mix, four master and four quad output channels in any combination. The twelve outputs may be configured to provide effects, sub-grouping, stage monitors, taping, or house mixes in any combination. All controls and indicators are color coded and logically arranged to aid in maintaining precise control over each signal.

Reliability and versatility of the Model 2000 have been road proven in hundreds of thousands of miles of travel and hundreds of flawless performances in concert halls, theaters and clubs of all sizes. No compromise has been made in either sound quality or construction of the console.

AUDIO PROCESSING SYSTEMS
 38 LANDSDOWNE STREET
 CAMBRIDGE, MA 02139
 (617) 263-8827

for additional information circle no. 87

**CHEAPEST-EVER REAL TIME
 THIRD OCTAVE AUDIO
 SPECTRUM ANALYZER**

Eventide Clockworks has produced a real time audio spectrum analyzer designed to fit inside the Commodore PET computer, and costing about one-sixth the price of currently available units. The combination of the Eventide unit and the PET gives features and capabilities never before available at any price.

The Eventide real time analyzer divides the audio spectrum from 20 Hz to 20 kHz into 31 third-octave bands, and displays those bands, with their relative amplitudes, on the PET screen. The unit can be used for measuring sound and noise levels, for optimizing the equalization of a hi-fi or public address system, for checking the frequency response of audio components,

**CURRENT USERS
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- Brian Elliot Sound
- City Recording
- Conway Recording
- Pravana Productions
- United-Western
- Westlake Audio

**STUDIO PROVEN
 ON MANY
 HIT RECORDS**



PRICE: \$5,000.00

ECOPLATE™

**THE WORLD'S MOST FAMOUS
 REVERBERATION SYSTEM HAS BEEN
 REDESIGNED**

Most high quality reverberation systems sound good by themselves, but the crucial test is: Do they enhance the music itself or tend to clutter it?

During a two year research program in Hollywood, many types of metal plates, suspension systems, drivers, pickups, etc., were examined. At the same time, some of the nation's top music mixers were consulted. The result is the **ECOPLATE™** with the following exclusive features:

- A new decay characteristic, centered around those frequencies which most enhance today's pop music. We took out the "boom" — and put in the "sizzle."
- Extended high frequency response.
- Improved pickups and driver give improved transient response.
- Low noise, high power amplifier.

DEALER INQUIRIES
 INVITED

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PROGRAMMING TECHNOLOGIES, INC.
 6666 N. Lincoln Avenue • Lincolnwood, IL 60645
 (312) 676-9400 • FREE DEMO TAPE AVAILABLE



and for speech and sound pattern recognition (useful for voice control systems).

Because of the capabilities of the Commodore PET, great flexibility in the manipulation of the analyzed data is permitted. The PET can store and recall spectral data, and compare them with past, future or other channel data. There is a peak hold feature, which enables the unit to determine whether any pre-set levels have been exceeded. Programs to access the analyzer are written in Basic — three are provided with the unit: Interactive Operation, Self Test, and Minimal Operation.

The Eventide real time analyzer comprises a single circuit board, which installs in

about five minutes inside the PET. It has 31 third-octave filters, detectors, an analog-to-digital converter, a 1K Read Only Memory which contains machine language routines, and the necessary peripheral circuitry for transferring data into the PET memory. The board draws its power from the PET transformer.

To introduce the analyzer, Eventide is running a contest — write a program which will recognize disco music. Prizes include Eventide T-shirts for any entries with merit, and either a real time analyzer or a Big Mem™ add-on memory board for the PET™ computer.

Dealer inquiries for the Eventide real time analyzer and Big Mem boards are invited. The cost of the analyzer is \$595, and delivery is ex stock.

EVENTIDE CLOCKWORKS
265 WEST 54TH STREET
NEW YORK, NY 10019
(212) 581-9290

for additional information circle no. 89

JHD AUDIO'S MAINLINE™
SEND SYSTEMS ANNOUNCED

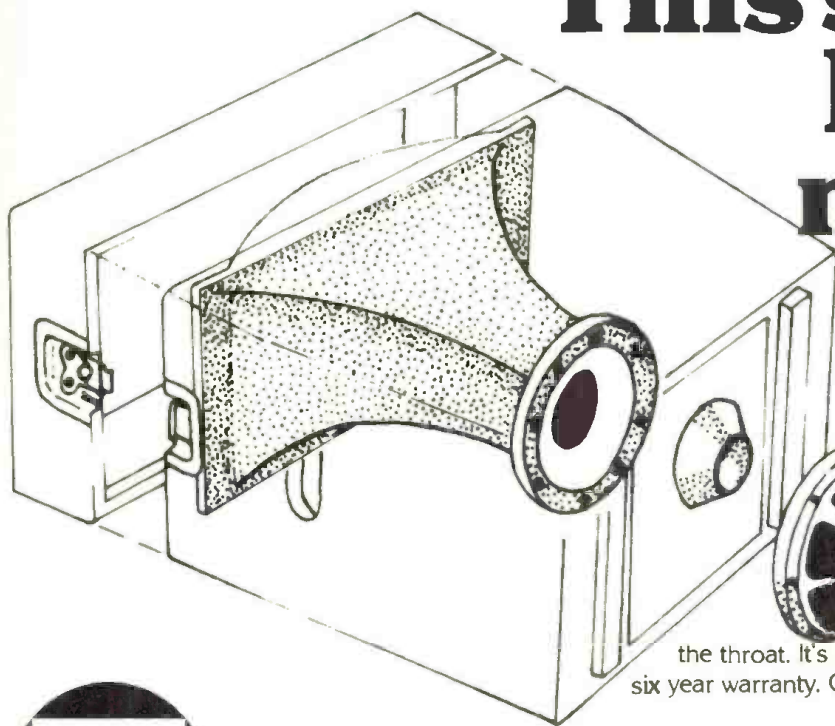
The MAINLINE™ System will encode and combine eight signals and transmit them up to 600 feet using only one standard microphone cable. At the output module the composite signal will be decoded into the eight separate signals for mixing with no



gain loss (it is claimed that there is actually a gain increase). The system is said to improve microphone performance by expanding dynamic range, extending frequency response, and drastically reducing hum and noise. It is further claimed to reject CB and RF interference.

According to the manufacturer, the system employs analog and digital technology to create a unique *time domain multiplexing* system specifically designed for high quality audio reproduction. The system contains two modules connected by a standard microphone cable. The eight channel input module encodes and transmits data to the output module (at the console) which decodes the signals and feeds the mixer.

There are three different MAINLINE™ encoder designs. One is for balanced low impedance microphones; one is for high



This singular lower midrange system

improves intelligibility in the voice frequencies to a new order in high power sound reinforcement. The exciting new ATC 9" driver connects to a straight exponential horn using an integral phasing plug for enhanced dispersion. The hand-laminated fiberglass horn is lead-sheeted and polyurethane damped to eliminate resonances, even at 130 dB SPLs at the throat. It's built for the road and has an unprecedented six year warranty. Call or write for the "works".

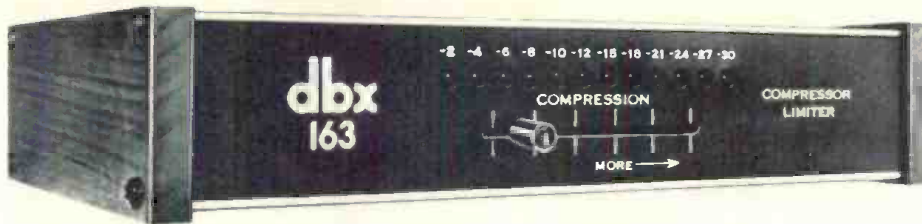


Eastern Acoustic Works, Inc.

59 Fountain Street, Box 111, Framingham, Massachusetts 01701/(617) 620-1478

for additional information circle no. 90

R-e/p 123



impedance instruments; another for mixer output signals. The decoder module has output levels that accommodate all mixers and/or amplifiers. The MAINLINE™ is supplied with a 100-foot cable. It is calibrated to operate with cable lengths of 25- to 600-feet without sacrificing performance. The system can be adapted to perform at any distance.

Information is available through Aspen & Associates by telephoning (213) 362-1551.

JHD AUDIO

1370 LOGAN AVENUE, UNIT F
COSTA MESA, CA 92626

for additional information circle no. 92

**dbx ANNOUNCES NEW
PROFESSIONAL COMPRESSOR/
LIMITER FOR UNDER \$200**

dbx, Incorporated, manufacturers of signal processing equipment for the professional and consumer markets, has introduced a professional compressor/lim-

iter, the Model 163 "one knob squeezer"™ which, according to dbx is the easiest to operate compressor/limiter on the market. It has a nationally advertised value of \$189.00.

Called the "one knob squeezer" because it has only one front panel control to adjust the amount of compression desired, the 163 employs a unique design to enhance and simplify the work of the studio operator. As compression is increased, the output gain is automatically increased to maintain a constant output level.

The 163 features the newly designed "Over Easy"™ compression circuit. All compressor/limiters utilize a threshold, which is the point of gain change. Below this threshold, the signal passes unchanged; above this threshold it is compressed at the pre-selected compression ratio, suddenly and audibly. The dbx "Over Easy" concept permits the signal to pass through the threshold point and gradually adds the

desired amount of compression over the range of several dB. This results in optimum compression that is virtually inaudible.

Instead of a peak detection system commonly used in conventional compressor/limiters which can alter program material, the 163 uses dbx's exclusive and patented true RMS level detection which closely simulates the response of the human ear.

Other features include: feed forward gain reduction so that even infinite compression can be achieved with complete stability and inaudible distortion. This also makes it possible for the attack and release rates to follow the rate of level change in the program material (envelope shape) automatically, to simplify operation and preserve the "naturalness" of the sound quality. The front panel has a 12 LED display to indicate gain change.

dbx, INCORPORATED
71 CHAPEL STREET
NEWTON, MA 02195
(617) 964-3210

for additional information circle no. 93

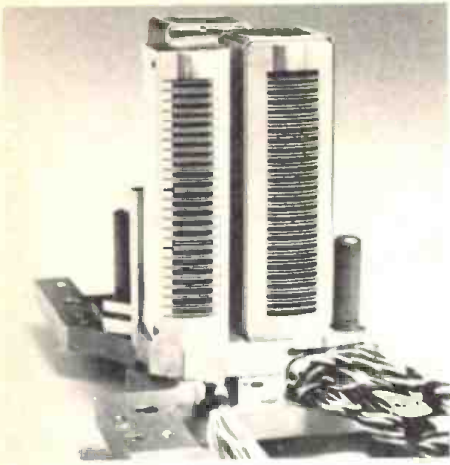
**NEW SAKI 24 TRACK
FERRITE REPLACEMENT
HEAD FOR MINCOM M79**

Saki Magnetics, of Santa Monica, California, has introduced the first hot pressed glass bonded 24 track ferrite head

btx 30-track audio

The superb BTX 4500 SMPTE interlocking system allows the operation of any two multi-track recorders in tandem for 14, 22, 30 or 46-track capability. Any two recorders may be precisely locked regardless of make, format, speed or number of tracks.

The BTX Corporation | 138 Boston Post Road, Weston, Massachusetts 02193 • (617) 891-1239
| 6255 Sunset Boulevard, Hollywood, California 90028 • (213) 462-1506



system for the Mincom M79 recorder. These heads are available in all standard track formats from 1/4" up to 2" tape. The new Saki head is manufactured of hot pressed ferrite with glass bonded gaps. This new ferrite head will outwear a standard metal head by 15 times life.

For pricing and delivery, contact:
SAKI MAGNETICS, INC.
 1649 - 12TH STREET
 SANTA MONICA, CA 90404
 (213) 450-1551

for additional information circle no. 95

**ORBAN 526A DYNAMIC
 SIBILANCE CONTROLLER**

The Orban 526A Dynamic Sibilance Controller performs effective and subtle de-essing of vocal material in order to reduce excessive sibilance to natural levels in recording and broadcast applications.

The technique used is superior to conventional EQ solutions for excessive and annoying sibilance because it does not degrade intelligibility or presence and because it adds no distortion or other processing artifacts.

The unit features a threshold-tracking circuit which maintains a constant level of de-essing in spite of input level variations. A set of lamps monitors both the de-essing action and the output level.

The input is transformer-coupled and will accept mike or line levels through a built-in XLR-style connector. Output is transformer balanced and floating.

Its design, packaging and specifications meet full professional standards.

The unit is available through professional audio and broadcast dealers throughout the



world at a suggested list price of \$399.00.
ORBAN ASSOCIATES, INC.
 645 BRYANT STREET
 SAN FRANCISCO, CA 94107
 (415) 957-1067

for additional information circle no. 96

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SOUND RECORDING

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 "The best book on the technical
 side of recording thoroughly
 recommended."

— Studio Sound
 338 Pages, illustrated with 232 tables,
 curves, schematic diagrams, photographs,
 and cutaway views of equipment.
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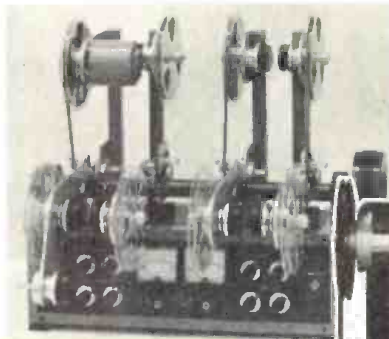
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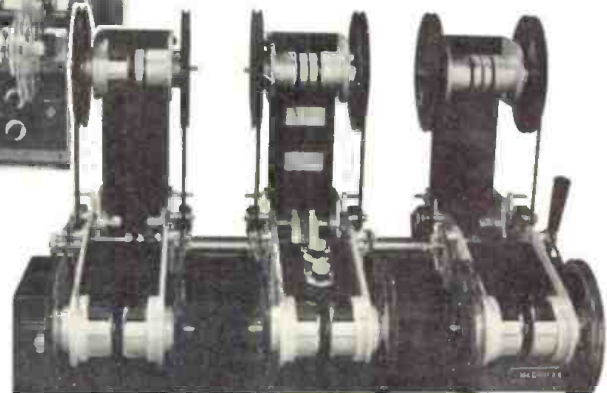
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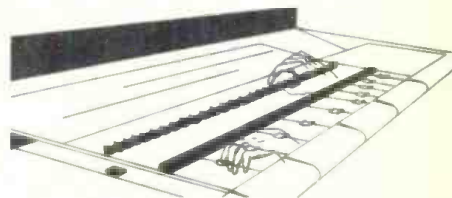
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... continued from page 17:

AUTOMATED MUTING

when you mixed the tune six months before. However, some of the information that you used in the original mix can be useful during subsequent re-mixes. The most important of these is the muting data. From a recording standpoint, being able to turn the tracks on *only* when there is desired program does substantially clean up a mix. With conventional mixing consoles it's likely only the most obvious noises would get muting attention. By using the computer and doing a number of passes it's possible to program a muting sequence for every track. Once this function is written, and as long as the sequence doesn't change, the engineer can forget about having to key things on and off. Since remembering muting cues is a very fatiguing part of mixing and prone to error, elimination of manual control has the effect of freeing up the engineer to do other more creative things. It saves time and money because the mixer has to remember fewer cues, and can concentrate on strictly the balance.

Elaborate muting sequences as those on many disco records can be accomplished over and over again without the computer ever forgetting a cue.

Regardless of the artistic aspects I find myself consistently using the practice to improve my overall signal-to-noise. The engineer who insists on 30 ips with Dolby will find computer assisted muting will take him one step closer to the clarity he's trying to achieve.

The muting has a couple of other advantages. A count-off almost always precedes the downbeat of a basic track. The count-off, or drum clicks, if not keyed off will end up being fed to the echo chambers. The echo generated by the count will sustain into the program. On a conventional board the engineer will end up using all his fingers just to shut off the drums or whatever until right before the downbeat. This sort of split

second accuracy is quite a strain on a mixer's nerves, especially if he has to immediately start making level cues. A similar situation occurs at the fadeouts and endings. The muting can also control the echo returns and all the outboard gear that gets patched into line inputs farther on down the board.

In order to use the automation you do need an open track on the multitrack, but that doesn't necessarily mean that you lose a track production-wise. In practice the automation allows you to stack tracks. For instance, it's no problem in mixing a track that has a guitar on it during most of the song but becomes an organ in the solo.

By patching the track to two different inputs and muting those inputs so that one comes on during the solo, and the other prevails during the rest of the song, that one track can be treated in all respects as if it were two separate tracks. The computer will always make the appropriate changes.

To digress: When I have used the computer on previous mixes I will usually see what the computer says I did on the day the tune was originally mixed. Since I usually hear it differently, I then place the board in re-write but retain the muting information. Often I do not resort to a complete re-write since everything might be fine except for two or three changes. In such cases the computer can be put in an update mode.

I hope that I have been able to supply information that is relevant to all systems. But since most of my experience has been with an MCI-528, I dare say some things might be idiosyncratic. □ □ □

News

HORSMAN NAMED TO MARKETING POST AT BGW

Peter Horsman has been named vice president, marketing for BGW Systems, Hawthorne, California. He will work with



BGW's professional and consumer product lines of amplifiers, pre-amplifiers, and electronic crossover networks. Horsman joined BGW from James B. Lansing Sound, Inc., where he was Professional Division manager for the past four years of his seven years at JBL. Prior to joining JBL, Horsman spent nine years in the commercial sound engineering contracting business with Hannon Engineering.

MCI TO PURCHASE STP CORPORATION BUILDING

MCI, Inc., will purchase the building that currently serves as corporate headquarters for the STP Corporation, at 1400 West Commercial Boulevard, Ft. Lauderdale, Florida, according to MCI president G. C. "Jeep" Harned.

MCI, Inc., the world's largest manufacturer of professional recording equipment, has entered into an agreement to purchase 23.5 acres, including the 156,000 square-foot building and parking for more than 700, from L.C. Associates, of Chattanooga, Tennessee. Purchase price is \$4.25 million and closing will be on or before July 1st.

MCI currently operates from five north Broward buildings totalling 80,000 square feet. MCI will keep the building at 4007 N.E. 6th Avenue, in Ft. Lauderdale, which now serves as its worldwide headquarters. It is

the only one of the five MCI owns. "We're not going to give up the Oakland Park location," says Harned. "This city has been very good to us and we plan to locate our machine shop and sheet metal plant operations in it."

According to Harned, MCI will move into 30,000 square feet of the new building, currently occupied by the IRS, during May. "The first unit to move into the building will be a progressive assembly operation which employs between 60 and 100 people. STP will remain in the rest of the building until February 1, 1980, at which time we will move in our corporate headquarters and the rest of our production and research operations."

MCI currently employs 375 people. The acquisition of the building, coupled with heavy production demands from the industry, will mean the hiring of about 100 new people immediately and about 350 new workers by mid-1980. "All things equal, we plan to double our production in the twelve months ahead," says Harned. "The new building gives us the room to grow comfortably and employ more people from the Broward and Palm Beach communities."

MCI employs draftsmen, engineers, technicians, quality control inspectors, assembly line workers, marketers, accountants and secretaries, and plans to hire people in all of these areas immediately.

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R-e/p 131

**NEW STAINED GLASS WINDOWS
AT RCA CAMDEN MARK RETURN
OF 'HIS MASTER'S VOICE'**

New stained glass windows depicting the celebrated trademark, "His Master's Voice," glowed above the RCA Camden plant for the first time during April as a familiar landmark returned to the Delaware River waterfront.



The event restored to the Philadelphia/Camden area a scene well-known to residents and visitors for more than half-a-century. Stained glass windows created from the dog-and-phonograph painting had adorned the plant tower from 1915 to 1969 when they were replaced by RCA mono-

grams.

"Nipper" is the fox terrier who lived in England in the 1890s and whose harkening to the sound from a phonograph horn inspired the "His Master's Voice" painting. It was created by Francis Barraud, an English artist, and sold to the Gramophone Company, Ltd., of London.

The Victor Talking Machine Company acquired the American rights to the painting in 1901 and adopted it as its trademark. When RCA acquired Victor in 1929 these rights to the trademark were included and "Nipper" and the phonograph began to appear on company products.

**DUNCAN ACQUIRES
OPERATION OF
ARTISAN SOUND RECORDERS**

Kent R. Duncan, founder and president of Kendun Recorders, in Burbank, California, has announced the formation of a new corporation, Artisan Sound Recorders, Inc., and the acquisition of the assets of Artisan Audio Corporation, of Hollywood, California. Artisan Sound Recorders was a pioneer in the field of independent disk mastering and was owned and operated until June, 1979 by Robert MacLeod, a respected expert in the field of disk recording.

Artisan Sound Recorders will continue their dedication to improve the state-of-the-art in disk recording and the two existing cutting rooms will be renovated by the Sierra Audio Corporation of California.

Additionally, a state-of-the-art mixdown room will be added to the complex which will be open October 1, 1979. It will be

designed and built by the Sierra/Hidley team featuring the same acoustics that have made the new super studio at Kendun, "Mr. D's," so successful.

Duncan states, "This expansion of our recording activities will significantly increase our total involvement with the California record industry giving us a location in the heart of Hollywood and providing services in both areas of expertise that we have developed, that of recording as well as disk mastering. It is our feeling that Artisan can be a strong support facility to the many fine recording studios in central Hollywood providing 'round-the-clock disk cutting service on a timely basis.

"The attitude of excellence and attention to detail which is the Artisan standard will be amplified by the new Sierra Audio tri-amp monitor system and state-of-the-art electronics based upon Kendun's success in pioneering innovations in disk recording."

Kendun Recorders presently operates three live recording studios and two disk mastering rooms in Burbank.

**3M ANNOUNCES NEW LEASE
PLANS; DEMOS DIGITAL
PLAYBACK AT AES**

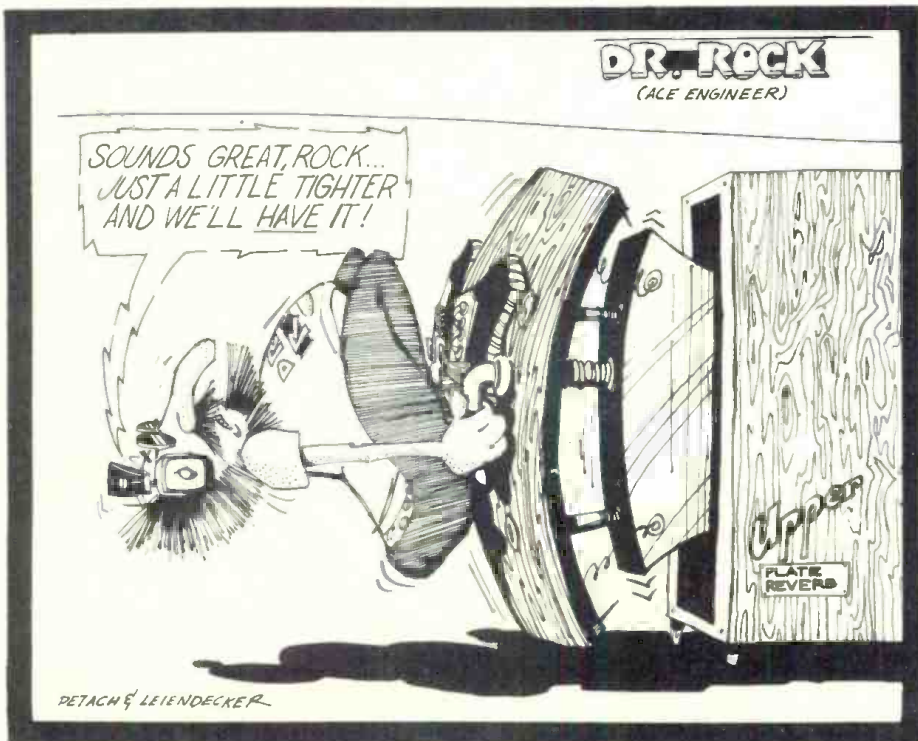
Two new lease arrangements were announced by 3M for its digital mastering system, and the company demonstrated digital music playback at the AES convention.

Added to the standard two-year lease for the two-recorder system, are separate leases for the 32-track pre-mix recorder and the 2/4-track stereo master recorder. Installation fee for either recorder is half that of the full system (\$5,000.00) and the monthly lease around \$3,000.00 and \$1,000.00, respectively.

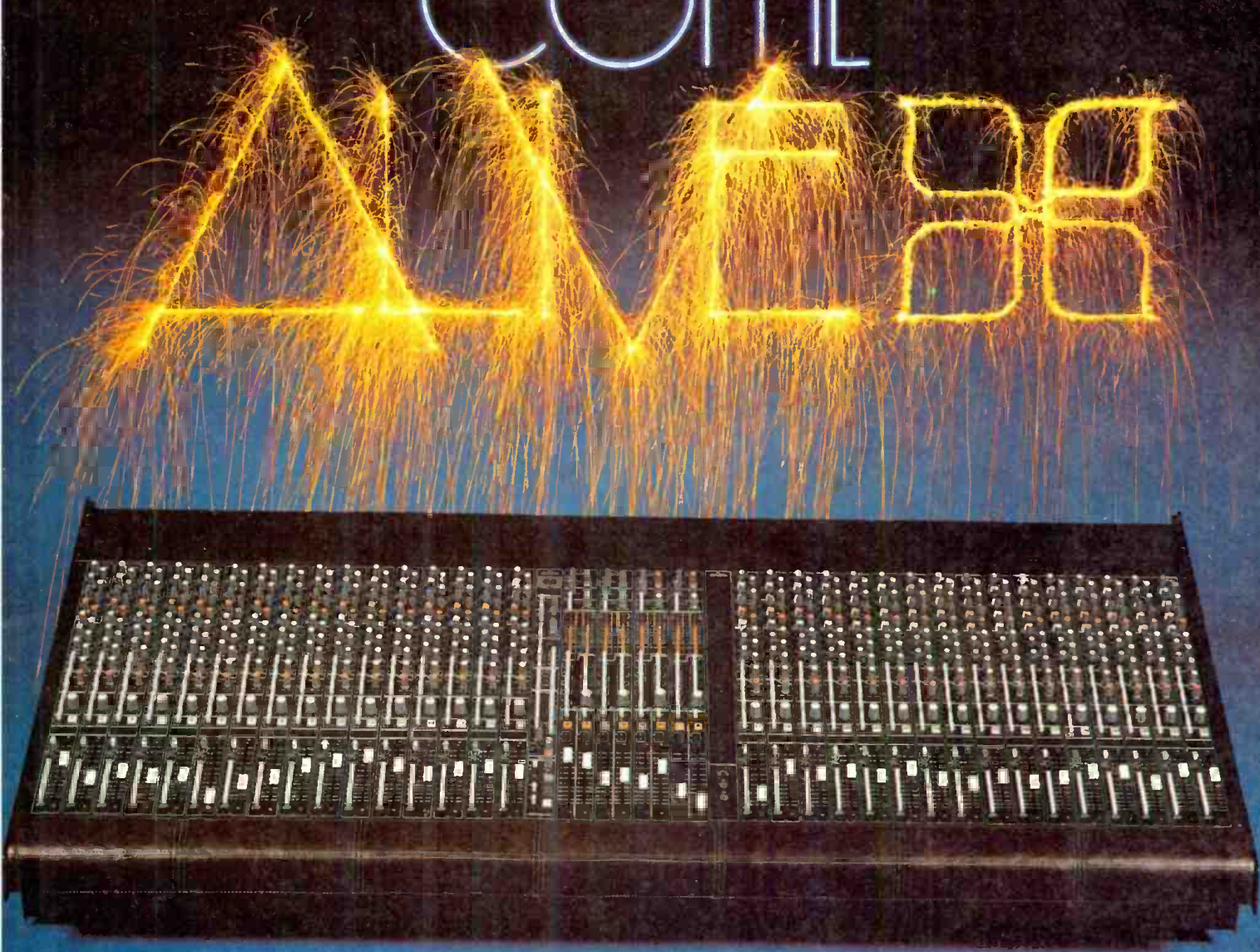
According to Bob Brown, Mincom Division marketing director, 3M is well along in the process of gearing up its Camarillo, California, plant for continuous production of the digital systems. Some delays have been encountered, however, due to the long lead time required to develop production versions of certain sophisticated components created specifically for this technology. Despite these interruptions and the inevitable refinements added, Brown said at least four more systems will be installed this year. He added that individual machines, while they can be signed up for now, will probably not be available before year-end.

Full systems have been delivered to four studios: A&M Records, Hollywood; Record Plant, Los Angeles; Sound 80, Inc., Minneapolis; and Warner Brothers Records, North Hollywood. These studios are reported to be particularly enthusiastic about the sound purity offered by the 3M digital equipment.

Digital recordings include a Herb Alpert single soon to be released (A&M Records),



COME



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Bonnie Pointer single recently released by Motown (Record Plant), the St. Paul Chamber Orchestra's released album of Copland's "Appalachian Spring" (Sound 80), Ry Gooder album soon to be released (Warner Brothers Records), and a New York Philharmonic Orchestra recording session (Columbia Masterworks). A number of other projects have been complete or are in the works.

3M had also planned to demonstrate the first working prototype of its electronic digital editing system doing multitrack assembly edits. But, although generally pleased with the initial editing performance of the equipment, it could not be perfected in time for the AES show.

Esthetic selection of edits will continue to be made by an operator. But, with the editor and two digital recorders, execution of the copying process for creating a master from selected musical sequences will be done automatically. Sitting before an editing console, an operator will select a potential edit point by ear, refine it by matching the audible sound with a graphic representation of the sound displayed on a video screen, then program the microprocessors to precisely and accurately implement the edit.

The system is capable of hard switch and cross-fade edits, either of which may be dovetailed. The system can assemble various segments from different tapes into a complete master, "tighten up" a tape by removing quiet passages to better fit time constraints, prepare album masters by placing selections in the desired sequence with the proper lead between "cuts," mix

multiple takes from master tracks (ping-ponging) and "insert" edit fresh material into one or more tracks to eliminate extraneous sound (sweetening).

Because all functions are performed entirely in the "digital domain," no generation loss occurs and mechanical integrity of the tape is assured (no splices). A major feature is the ability to preview any of these functions prior to editing, and simply re-edit at any time.

"This editing system is certainly a necessary and exciting adjunct of the digital mastering process," explained Bob Youngquist, manager of advanced recording. "Not only will the editor expand the use of the 3M digital recorders to those artists requiring or desiring considerable editing, but it will enhance the creativity and the degree of precision and repeatability that can be applied to programming an edit, then automate machine execution."

Despite the additional sophisticated microprocessor technology that the system will bring to the operator's fingertips, learning how to use the system will be relatively easy, says Youngquist, because it is interactive. A video display of a series of questions "walks" the operator through the decision-making sequence.

According to Youngquist, the prototype of the editing system will be field tested this summer by bicycling it on an as-needed basis among the four studios currently employing the 3M mastering system. Production and specific marketing plans for the editing system will be announced after studio evaluation.

EDWARD MAY

Edward May, a prominent figure in the design of loudspeakers, died on May 13, 1979 at the age of 68. He was born on July 1, 1910, in Eureka, Utah.

Though he attended some classes at the University of Utah, his education was



essentially self-taught. He built his first speaker in 1924 at the age of 14. He worked in Dallas, Texas, with the Frazer-May company until 1957 when he came to California and joined JBL. He left there in 1970 and for two years was with Cetec-Gauss, returning to JBL in 1972 where he stayed until the fall of 1976. At that time he became vice president in charge of loudspeaker engineering for Marantz-Superscope.

His designing achievements covered a broad range of products. At Gauss-Cetec he was responsible from concept to manufacturing of all their direct radiator speakers. At JBL he designed all of the LE (Linear Efficiency) components, the L-100, the Decade Family, and the 4310, 4311, 4320 studio monitor series. He also worked on the components and horns for the 4333s.

Before his death he had been actively designing components for Marantz-Superscope, including the Mark II, the new High Definition, and the Design Series loudspeakers.

Mr. May was a Fellow in the Audio Engineering Society.

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